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Yamasaki

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(54) **DRAWING APPARATUS AND DRAWING METHOD OF DRAWING APPARATUS**

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B41J 3/407 (2006.01)

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CPC ***B41J 3/4073*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 3/4073
USPC 347/16
See application file for complete search history.

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(57) **ABSTRACT**

A drawing apparatus and drawing method to perform drawing on a drawing target region are shown. The drawing apparatus includes a drawing unit and a control unit. The drawing target region is a surface of a plurality of nails and the nails include unit regions in contact with each other to be drawn with ink in different colors. The control unit includes a nail specifying unit which judges whether each of the unit regions is a dried unit region, a non-dried unit region, and a non-drawn unit region. Then, the nail specifying unit extracts the non-drawn unit region which is not in contact with the non-dried unit region as a specific unit region. The control unit also includes a drawing control unit which controls the drawing unit to perform the drawing on the specific unit region.

18 Claims, 8 Drawing Sheets

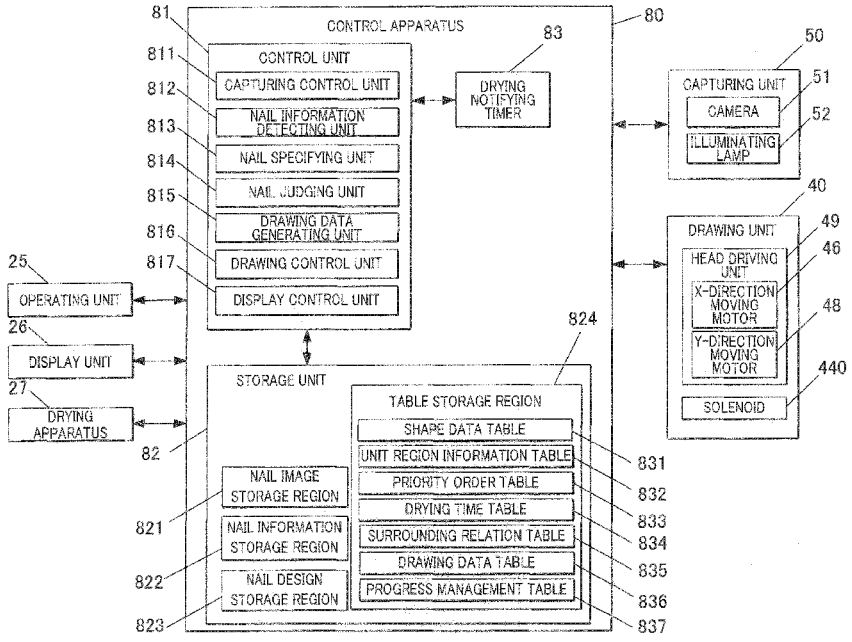
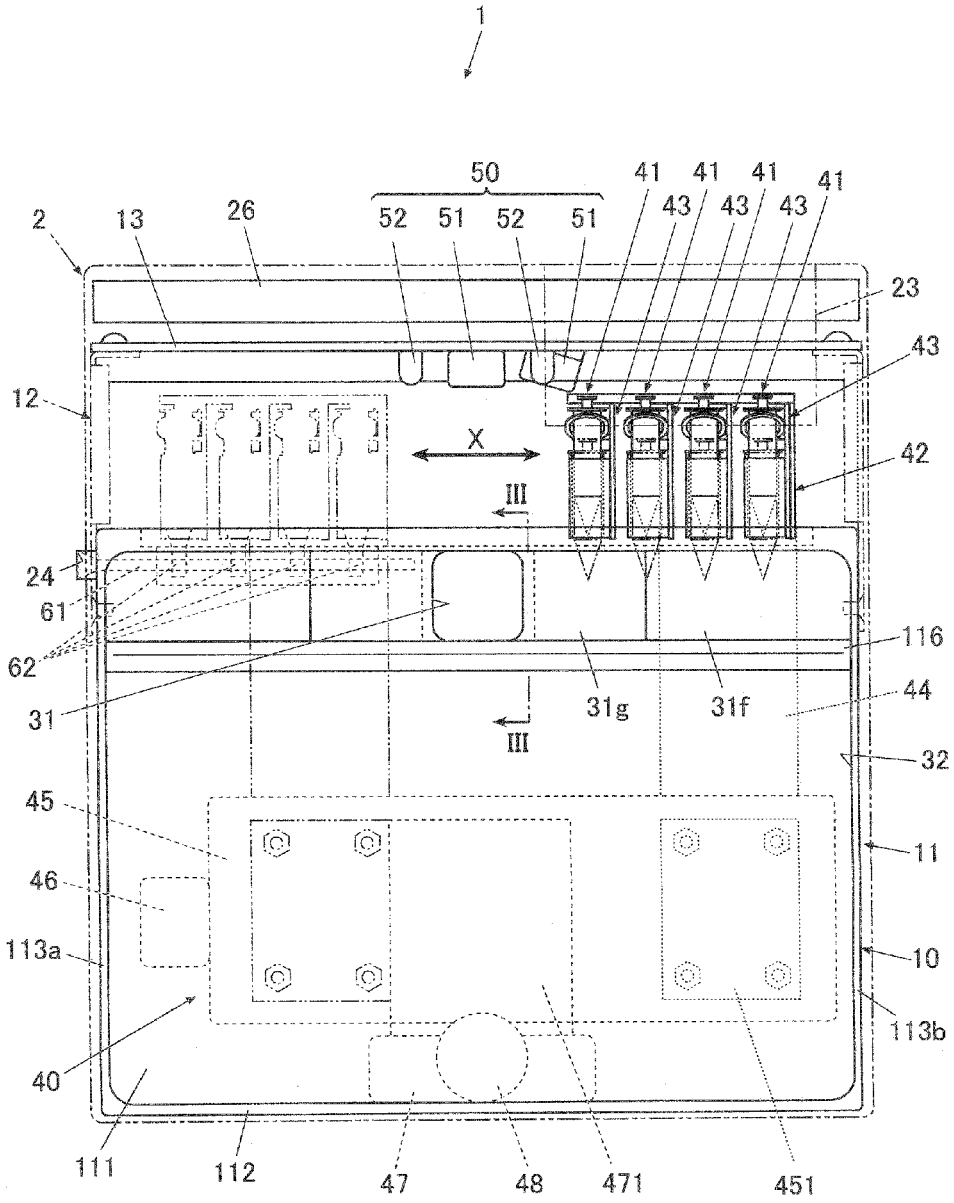


FIG.1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2
13
26
50
52
51
52
51
41
41
41
41
43
43
43
43
23
43
12
X
III
42
24
61
62
31
III
31g
31f
116
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32
45
46
113a
11
10
113b
40
111
112
47
48
471
451

FIG.2

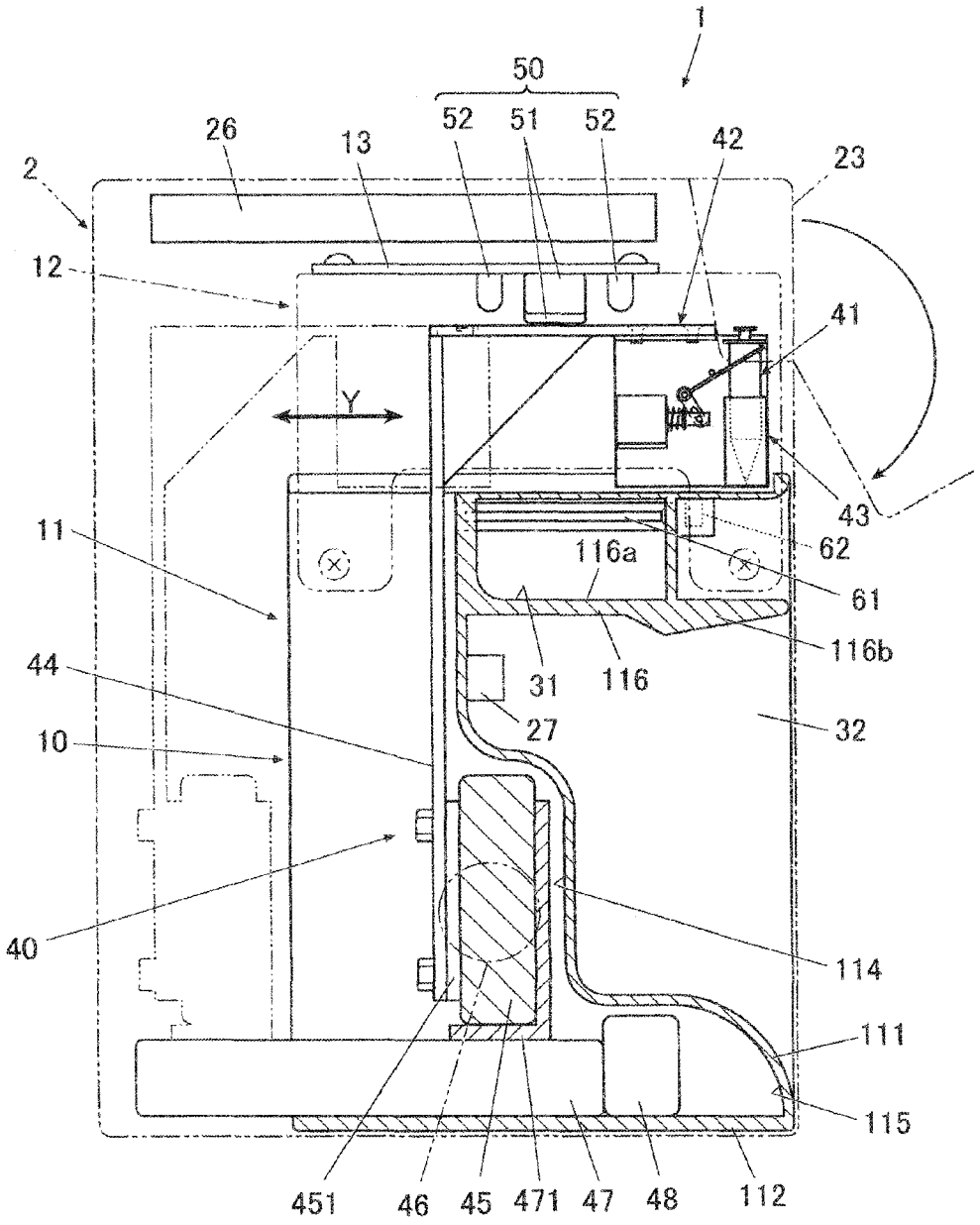

1
50
52
51
52
26
13
42
23
2
12
41
Y
43
11
62
116a
61
116b
44
31
116
27
32
10
40
114
111
115
451
46
45
471
47
48
112

FIG.3

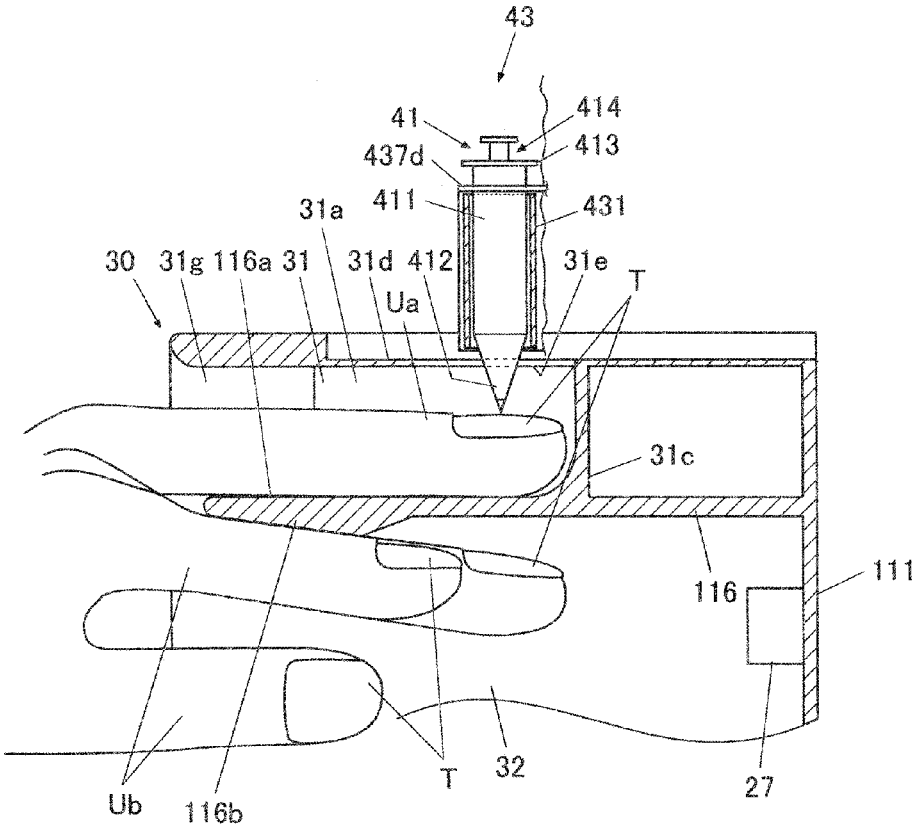

43
41
414
413
437d
411
431
31a
30
31g
116a
31
31d
412
31e
T
Ua
31c
111
116
27
32
T
Ub
116b

FIG.4B

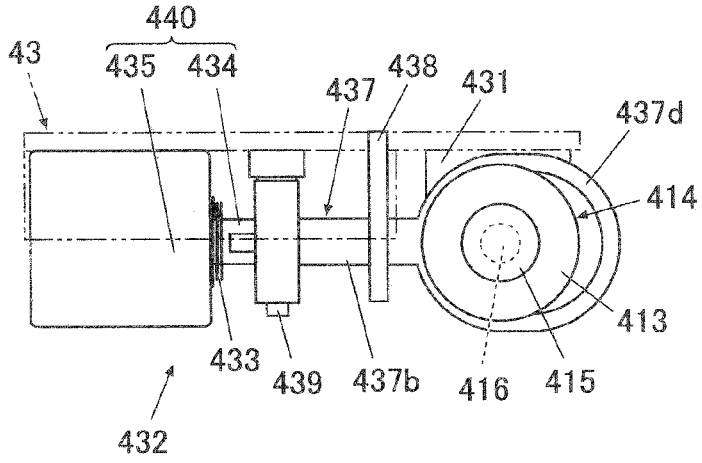


FIG.4A

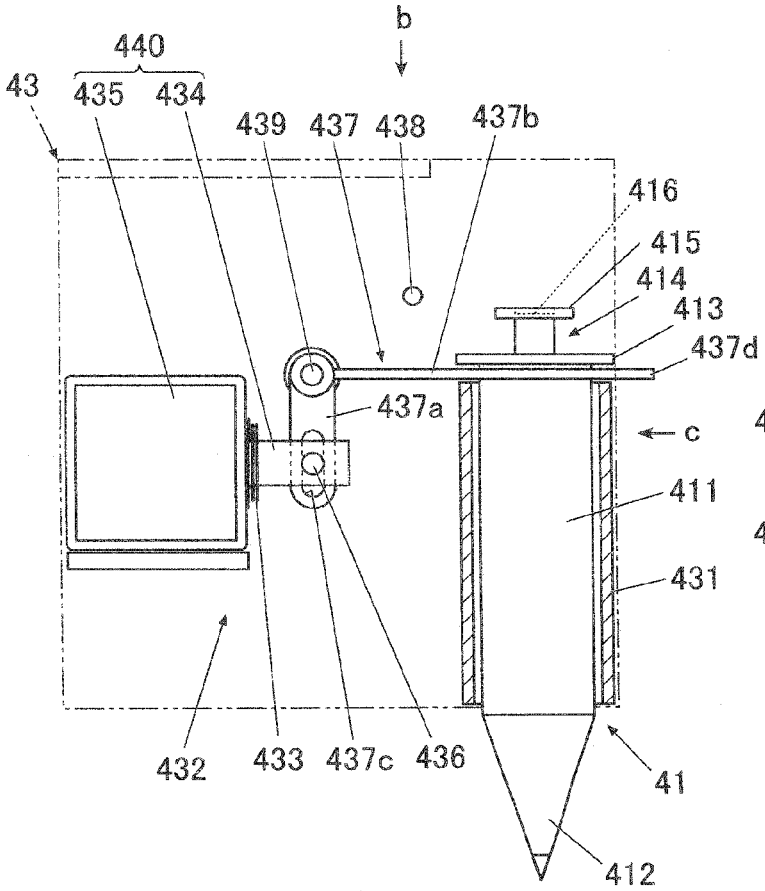
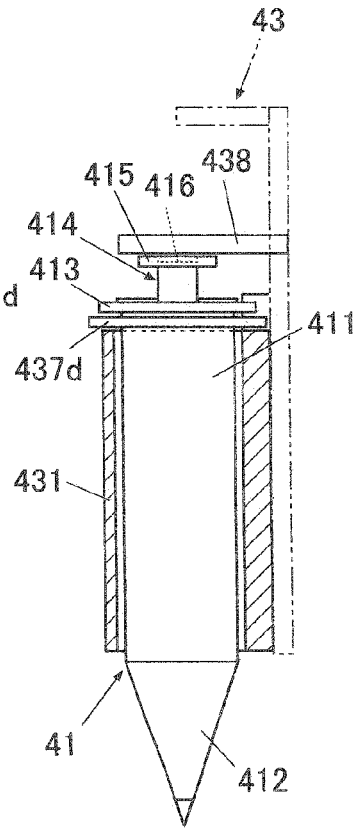


FIG.4C



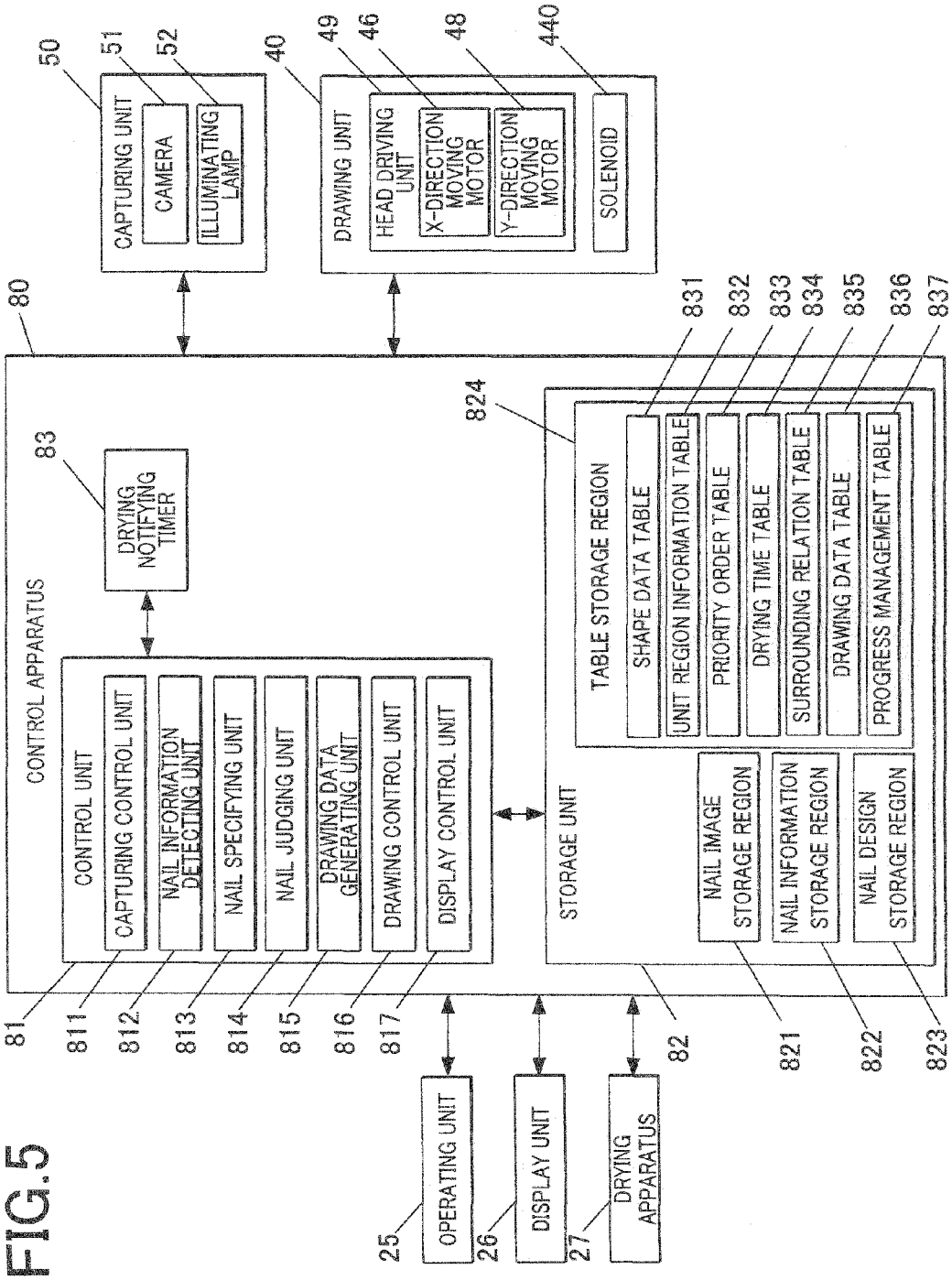

50
51
52
40
49
46
48
440
CAPTURING UNIT
CAMERA
ILLUMINATING LAMP
DRAWING UNIT
HEAD DRIVING UNIT
X-DIRECTION MOVING MOTOR
Y-DIRECTION MOVING MOTOR
SOLENOID
80
831
832
833
834
835
836
837
824
83
DRYING NOTIFYING TIMER
CONTROL APPARATUS
TABLE STORAGE REGION
SHAPE DATA TABLE
UNIT REGION INFORMATION TABLE
PRIORITY ORDER TABLE
DRYING TIME TABLE
SURROUNDING RELATION TABLE
DRAWING DATA TABLE
PROGRESS MANAGEMENT TABLE
CONTROL UNIT
CAPTURING CONTROL UNIT
NAIL INFORMATION DETECTING UNIT
NAIL SPECIFYING UNIT
NAIL JUDGING UNIT
DRAWING DATA GENERATING UNIT
DRAWING CONTROL UNIT
DISPLAY CONTROL UNIT
STORAGE UNIT
NAIL IMAGE STORAGE REGION
NAIL INFORMATION STORAGE REGION
NAIL DESIGN STORAGE REGION
81
811
812
813
814
815
816
817
82
821
822
823
25
26
27
OPERATING UNIT
DISPLAY UNIT
DRYING APPARATUS

FIG.5

FIG.6

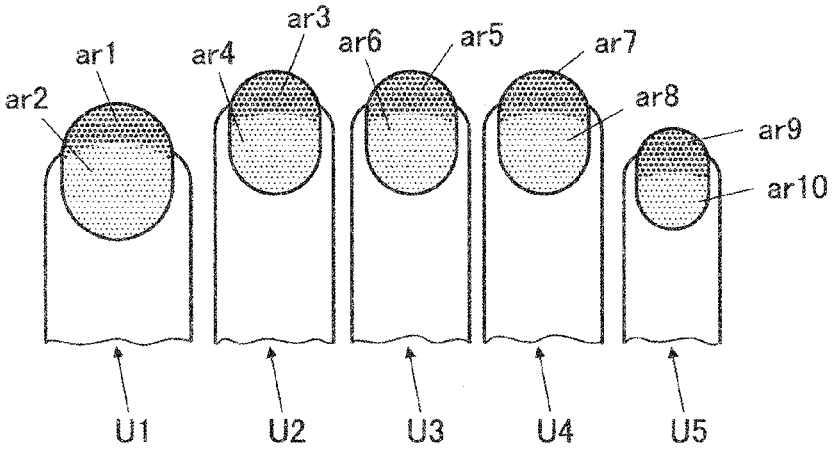

ar1
ar2
ar3
ar4
ar5
ar6
ar7
ar8
ar9
ar10
U1
U2
U3
U4
U5

FIG.7

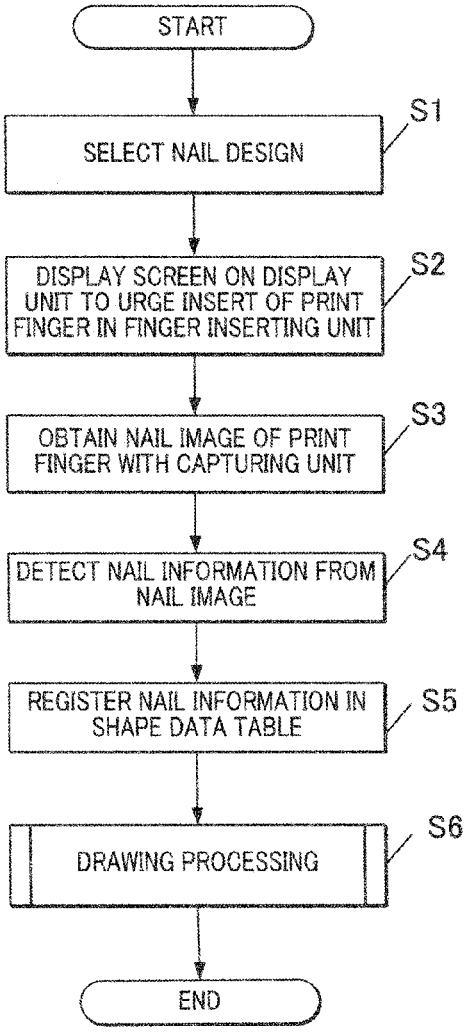

START
SELECT NAIL DESIGN
S1
DISPLAY SCREEN ON DISPLAY UNIT TO URGE INSERT OF PRINT FINGER IN FINGER INSERTING UNIT
S2
OBTAIN NAIL IMAGE OF PRINT FINGER WITH CAPTURING UNIT
S3
DETECT NAIL INFORMATION FROM NAIL IMAGE
S4
REGISTER NAIL INFORMATION IN SHAPE DATA TABLE
S5
DRAWING PROCESSING
S6
END

FIG.8

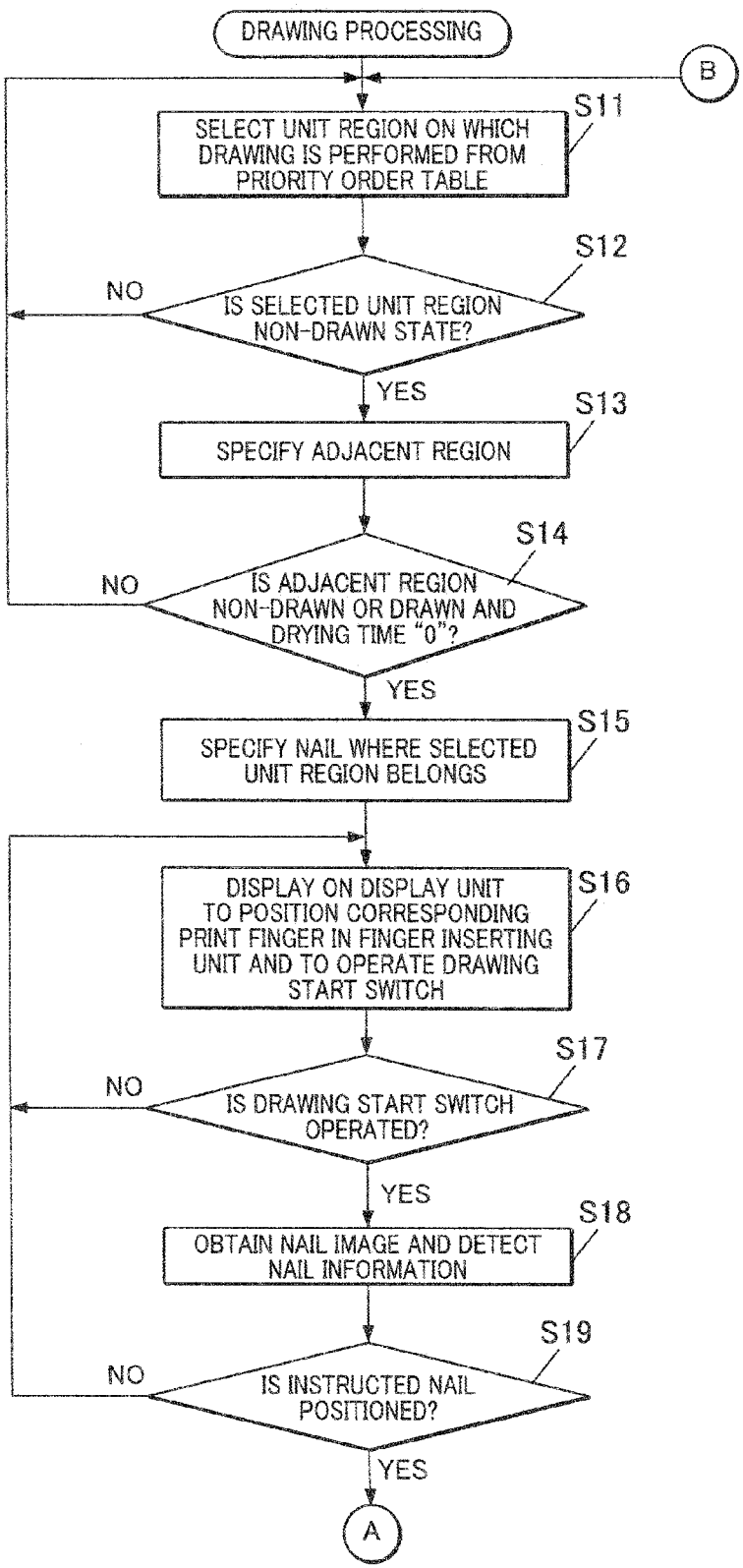
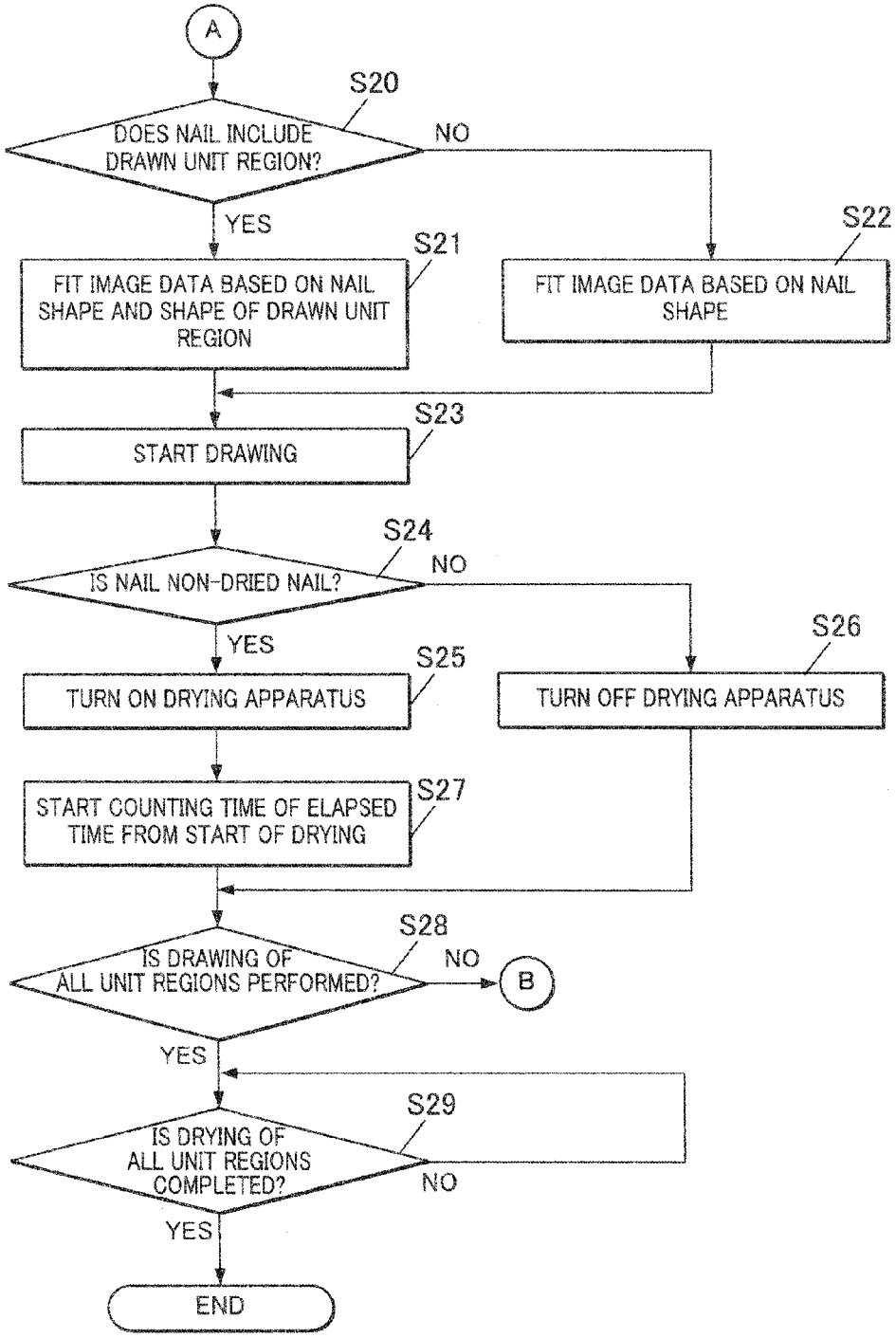

DRAWING PROCESSING
B
S11
SELECT UNIT REGION ON WHICH DRAWING IS PERFORMED FROM PRIORITY ORDER TABLE
S12
IS SELECTED UNIT REGION NON-DRAWN STATE?
NO
YES
S13
SPECIFY ADJACENT REGION
S14
IS ADJACENT REGION NON-DRAWN OR DRAWN AND DRYING TIME "0"?
NO
YES
S15
SPECIFY NAIL WHERE SELECTED UNIT REGION BELONGS
S16
DISPLAY ON DISPLAY UNIT TO POSITION CORRESPONDING PRINT FINGER IN FINGER INSERTING UNIT AND TO OPERATE DRAWING START SWITCH
S17
IS DRAWING START SWITCH OPERATED?
NO
YES
S18
OBTAIN NAIL IMAGE AND DETECT NAIL INFORMATION
S19
IS INSTRUCTED NAIL POSITIONED?
NO
YES
A

FIG.9


A
S20
DOES NAIL INCLUDE DRAWN UNIT REGION?
NO
YES
S21
FIT IMAGE DATA BASED ON NAIL SHAPE AND SHAPE OF DRAWN UNIT REGION
S22
FIT IMAGE DATA BASED ON NAIL SHAPE
S23
START DRAWING
S24
IS NAIL NON-DRIED NAIL?
NO
YES
S25
TURN ON DRYING APPARATUS
S26
TURN OFF DRYING APPARATUS
S27
START COUNTING TIME OF ELAPSED TIME FROM START OF DRYING
S28
IS DRAWING OF ALL UNIT REGIONS PERFORMED?
NO
B
YES
S29
IS DRYING OF ALL UNIT REGIONS COMPLETED?
NO
YES
END

DRAWING APPARATUS AND DRAWING METHOD OF DRAWING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

The present U.S. patent application claims priority under the Paris Convention of Japanese Patent Application No. 2014-133594 filed on Jun. 30, 2014 the entirety of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a drawing apparatus and a drawing method used in the drawing apparatus.

2. Description of the Related Art

There is a conventionally known ink-jet printer (drawing apparatus) which sprays ink from a drawing head to print a nail design on a nail. Such drawing apparatus is described in, for example, Japanese Patent Application Laid-Open Publication No. 2003-534083.

Printing on nails is easily possible at home if such drawing apparatuses are used.

However, it is difficult to eject ink including coloring material with large particle sizes as used in commercially available manicure from a drawing head of an ink-jet drawing apparatus. Therefore, there are problems such as the design that can be printed being limited or the finish not being beautiful.

It is also considered to use a plotter drawing apparatus which includes a drawing head with a writing tool such as a pen attached and an image is drawn by placing a sheet (target) to be in contact with the tip of the writing tool to draw a nail design on the nail. With such apparatus, the type of ink that can be used is not limited, and it is possible to draw on the nail a nail print similar to those drawn at a nail salon.

In a drawing apparatus which draws the nail design by plotting using many colors of ink, if drawing is performed in a region next to a region where drawing is already performed with a different color ink before the ink of the region drawn before is dried, the ink may be mixed at the boundary of the regions, and the image may be blurred or the color may blur. This results in a finish which is not beautiful.

Nails on which nail prints are drawn do not absorb ink. Therefore, it takes longer to dry ink on nails than ink drawn on paper. Therefore, the image and color blurring due to different color ink mixing easily occurs.

In order to prevent blurring of the image and the color, the next color needs to be drawn after waiting for the previously colored ink to dry. Since the time waiting for the ink to dry increases, a large amount of time is consumed for drawing.

Such waiting time becoming longer results in the drawing time becoming longer. This becomes a problem when nail print is performed on a plurality of nails of a plurality of fingers, such as when nail print is performed on plurality of nails of plurality of fingers of one hand or both hands.

BRIEF SUMMARY OF THE INVENTION

The present invention has been conceived in view of the above problems, and one of the main objects is to provide a drawing apparatus and a drawing method used in a drawing apparatus in which surfaces of a plurality of nails are drawing target regions and drawing is performed with a plurality of types of ink in a plurality of regions including portions where drawing target regions in each nail are in contact with each other to prevent blurring of the image and color due to different color ink being mixed while shortening the amount of time necessary to draw on a plurality of nails.

According to an aspect of the present invention, there is provided a drawing apparatus including:

a drawing unit which applies ink to a drawing target region to perform drawing, the drawing target region is a surface of a plurality of nails of a plurality of fingers of a hand or a foot; and

a control unit which controls the drawing unit to perform the drawing on the drawing target region,

wherein,

in the drawing target region, at least any one of the plurality of nails includes a plurality of unit regions which are in contact with each other in at least one portion;

each of the two unit regions in contact with each other is a region to be drawn with ink in different colors; and

the control unit includes:

a nail specifying unit which, after the drawing unit applies ink to at least one unit region in the drawing target region, judges whether each of the plurality of unit regions is a dried unit region in which drying of the applied ink is completed, a non-dried unit region in which drying of the applied ink is not completed, or a non-drawn unit region in which the ink is not applied; extracts a specific unit region from the plurality of unit regions, wherein the specific unit region is the non-drawn unit region which are not in contact with the non-dried unit region; and specifies the nail including the specific unit region as a specific nail; and

a drawing control unit which controls the drawing unit to perform the drawing on the specific unit region in the specific nail.

According to another aspect of the present invention, there is provided a drawing method of a drawing apparatus including:

wherein the drawing apparatus including a drawing unit which applies ink to a drawing target region to perform drawing, the drawing target region is a surface of a plurality of nails of a plurality of fingers of a hand or a foot, wherein, in the drawing target region, at least any one of the plurality of nails includes a plurality of unit regions which are in contact with each other in at least one portion; and each of the two unit regions in contact with each other is a region to be drawn with ink in different colors,

judging, after the drawing unit applies ink to at least one unit region in the drawing target region, whether each of the plurality of unit regions is a dried unit region in which drying of the applied ink is completed, a non-dried unit region in which drying of the applied ink is not completed, or a non-drawn unit region in which the ink is not applied;

extracting a specific unit region from the plurality of unit regions, wherein the specific unit region is the non-drawn unit region which are not in contact with the non-dried unit region;

specifying the nail including the specific unit region as a specific nail; and

controlling the drawing unit to perform the drawing on the specific unit region in the specific nail.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention and the above-described objects, features and advantages thereof will become more fully understood from the following detailed description with the accompanying drawings and wherein;

FIG. **1** is a front view of a nail print apparatus of the present embodiment;

FIG. **2** is a side view showing an internal configuration from a cross sectional view of a portion of the nail print apparatus shown in FIG. **1**;

FIG. **3** is a cross sectional view along line in FIG. **1**;

FIG. **4**A, FIG. **4**B, and FIG. **4**C are enlarged views of a writing tool carriage in a drawing state and a writing tool supported by the carriage, FIG. **4**A is a side view of a writing tool carriage and a writing tool, FIG. **4**B is an upper view of a writing tool carriage and a writing tool shown in FIG. **4**A viewed from an arrow b direction, FIG. **4**C is a front view of a writing tool carriage and a writing tool shown in FIG. **4**A viewed from an arrow c direction;

FIG. **5** is a main section block diagram showing a control configuration of a nail print apparatus of the present embodiment;

FIG. **6** is a diagram showing an example of a nail design which can be drawn by the nail print apparatus of the present embodiment;

FIG. **7** is a flowchart showing an entire flow of processing performed in the nail print apparatus of the present embodiment;

FIG. **8** is a flowchart showing drawing processing of a nail print apparatus of the present embodiment; and

FIG. **9** is a flowchart showing drawing processing of a nail print apparatus of the present embodiment.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of a drawing apparatus of the present embodiment is described with reference to the drawings. However, the scope of the present invention is not limited to the illustrated examples.

According to the drawing apparatus of the present embodiment, a nail is inserted in the drawing apparatus one nail at a time to draw on the nail of the finger and a plurality of fingers are successively switched so that drawing is performed on the nails of the plurality of fingers successively. According to the present embodiment, the drawing apparatus is a nail print apparatus.

According to the embodiments described below, technically preferred limitations are added to implement the present invention. However, the scope of the present invention is not limited to the embodiments and the illustrated examples described below.

FIG. **1** is a front view of the nail print apparatus, and FIG. **2** is a side view showing an internal configuration from a cross sectional view of a portion of the nail print apparatus shown in FIG. **1**.

As shown in FIG. **1** and FIG. **2**, a nail print apparatus **1** which is a drawing apparatus includes a case main body **2** and an apparatus main body **10** which is stored in the case main body **2**. The case main body is shown with an alternate long and two short dash lines in FIG. **1** and FIG. **2**.

A writing tool exchanging lid **23** is provided so as to be able to open and close in order to exchange a writing tool **41** such as a pen of a later described drawing unit **40** at one edge of an upper front face of the case main body **2**. The writing tool exchanging lid **23** is able to rotate by a hinge, etc. from a closed state to an opened state as shown in FIG. **2**.

A medium inserting opening **24** is formed at one side of the case main body **2** (according to the present embodiment, the left side in FIG. **1**) in a position corresponding to a later described writing tool testing unit **61** to replace a drawing medium (not shown) placed in the writing tool testing unit **61**.

An operating unit **25** (see FIG. **5**) is provided in an upper face (top plate) of the case main body **2**.

The operating unit **25** is an input unit for the user to perform various input.

For example, the operating unit **25** is provided with various operation buttons (not shown) to perform various input such as a power source switch button to turn on the power of the nail print apparatus **1**, a stop switch button to stop the operation, a design selection button to select a design image to be drawn on a nail T, a drawing start button to instruct start of drawing, and the like.

A display unit **26** is provided in substantially the center portion of the upper face (top plate) of the case main body **2**.

For example, the display unit **26** includes a liquid crystal display (LCD), an organic electroluminescence display or other flat display.

According to the present embodiment, the following images or screens are suitably displayed on the display unit **26**, for example, a nail image obtained by capturing a print finger ha (a finger image including an image of a nail T), an image of an outline, etc. of the nail T included in the nail image, a design selection screen to select a design image to be drawn on the nail T, a thumbnail image for confirming the design, an instruction screen to display various instructions, and the like.

The touch panel is formed as one with a surface of the display unit **26**. In this case, for example, various selection and instruction can be executed by touching the surface of the touch panel with the finger tip, etc. Other than a finger, various input can be performed by touching the surface of the display unit **26** with, for example, a stylus pen or other tool which is a sharp stick shape.

The apparatus main body **10** is formed in a substantial box shape and includes a lower machine frame **11** provided in a lower portion inside the case main body **2** and an upper machine frame **12** provided above the lower machine frame **11** in an upper portion inside the case main body **2**.

First, the lower machine frame **11** is described.

The lower machine frame **11** includes a back face plate **111**, a bottom plate **112**, a pair of left and right side plates **113***a* and **113***b*, an X-direction moving stage storing unit **114**, a Y-direction moving stage storing unit **115** and a partition wall **116**.

A bottom edge portion of side plates **113***a* and **113***b* are each connected to both left and right edge portions of the bottom plate **112**, and the side plates **113***a* and **113***b* are provided in a state standing from the bottom plate **112**.

As shown in FIG. **2**, the lower portion of the back face plate **111** is formed to be caved in two steps toward the front (near side in finger inserting direction). The lower edge portion of the back face plate **111** is connected to the front edge portion of the bottom plate **112**, and the back face plate **111** divides the region surrounded by the bottom plate **112** and the side plates **113***a* and **113***b* into front and back.

The caved in space formed on the back side of the back face plate **111** is to be the X-direction moving stage storing unit **114** and Y-direction moving stage storing unit **115** (see FIG. **2**). An X-direction moving stage **45** of the drawing unit **40** is stored when the drawing unit **40** (see FIG. **2**) is moved forward (near side in finger inserting direction) in the X-direction moving stage storing unit **114**. The Y-direction moving stage **47** of the drawing unit **40** is positioned in the Y-direction moving stage storing unit **115**.

The partition wall **116** is provided inside the lower machine frame **11** so as to divide the space on the front side inside the lower machine frame **11** into top and bottom (space on the near side in the finger inserting direction surrounded by the back face plate **111**, bottom plate **112**, and side plates **113***a* and **113***b*). The partition wall **116** is provided substantially

horizontal, both left and right edge portions of the partition wall **116** are respectively connected to the side walls **113***a* and **113***b*, and the back edge portion of the partition wall **116** is connected to the back face plate **111**.

A finger fixing unit **30** is provided as one with the lower machine frame **11**.

A finger fixing unit **30** is described with reference to FIG. **3**.

FIG. **3** is a cross sectional view showing the cross section along line shown in FIG. **1** viewed in the arrow direction.

The finger fixing unit **30** is composed of a finger inserting unit **31** in which the finger corresponding to the nail T on which drawing is performed (hereinafter referred to as "print finger Ua") is inserted and a finger shelter unit **32** where the fingers other than the print finger Ua (hereinafter referred to as "non-print finger Ub") are evacuated.

The finger inserting unit **31** is positioned in substantially the center in the width direction of the lower machine frame **11** on the upper side of the partition wall **116**.

The space on the lower side of the lower machine frame **11** divided by the partition wall **116** composes the finger shelter unit **32**.

For example, when drawing is performed on the nail T of the ring finger, as shown in FIG. **3**, the ring finger as the print finger Ua is inserted in the finger inserting unit **31** and the other four fingers (thumb, index finger, middle finger, little finger) which are the non-print fingers Ub are inserted in the finger shelter unit **32**.

According to the present embodiment, the print finger Ua corresponding to the nail T as the drawing object is inserted one by one in the finger inserting unit **31**, the nail T is positioned in a predetermined drawing position, drawing is performed on the nail T, and with this, the finger is suitably replaced to successively draw on the plurality of nails T.

The finger inserting unit **31** is open to the front face side of the lower machine frame **11** (near side in the print finger inserting direction). The lower side is divided by a finger placing unit **116***a* which is a portion of the partition wall **116**, both sides are divided by partition **31***a*, and the far side is divided by the partition **31***c*. The finger placing unit **116***a* is where the finger of the nail T on which the drawing is performed (print finger Ua) is placed on a X-Y plane.

The upper side of the finger inserting unit **31** is divided by a ceiling unit **31***d*.

A window **31***e* is formed in the ceiling unit **31***d* to expose the nail T of the print finger Ua inserted in the finger inserting unit **31**.

Moreover, a front wall **31***f* (see FIG. **1**) is provided standing on both side portions of the front face side of the lower machine frame **11** on the upper face of the partition wall **116** to cover the front face side of the lower machine frame **11**.

On the upper face of the partition wall **116**, a pair of guide walls **31***g* is provided standing in a shape becoming narrow from the edge of the front wall **31***f* to the center portion side toward the finger inserting unit **31** to guide the print finger Ua in the finger inserting unit **31**.

The user is able to place the partition wall **116** between the print finger Ua inserted in the finger inserting unit **31** and the non-print finger Ub inserted in the finger shelter unit **32**. Therefore, the print finger Ua inserted in the finger inserting unit **31** is stably fixed.

According to the present embodiment, a projecting unit **116***b* projecting downward is formed in the front edge portion of the partition wall **116**. The projecting unit **116***b* can be a tapered portion in which the thickness becomes gradually thinner toward the near side and gradually thicker toward the far side, or a configuration in which the thickness of the entire projecting unit **116***b* is thick compared to the caved in portion at the far side of the partition wall **116**. Since the projecting unit **116***b* is formed in the front edge portion of the partition wall **116**, there is a space between the nail T of the finger on which the drawing is already performed and the partition wall **116** when the non-print finger Ub is inserted in the finger shelter unit **32**. Therefore, it is possible to prevent the nail T coming into contact with the bottom face of the partition wall **116** and the ink attaching to the apparatus or the design drawn on the nail T becoming damaged.

A drying apparatus **27** to dry the ink applied to the nail T is provided in the finger shelter unit **32**. The drying apparatus **27** includes, for example a heater and a fan which are not shown.

According to the present embodiment, the drying apparatus **27** is attached to the wall on the far side of the finger shelter unit **32**.

The configuration of the drying apparatus **27** and the position where the drying apparatus **27** is provided is not limited to the examples illustrated here. For example, the drying apparatus **27** can be composed of only a fan or only a heater.

Moreover, when the drawing is performed using photocurable ink (for example, UV curable ink), the drying apparatus **27** can be a light emitting apparatus which is able to emit light with a wavelength suitable for curing the ink.

A writing tool testing unit **61** is provided in a position on the upper face of the partition wall **116** and on the side of the finger inserting unit **31** (a position corresponding to the medium inserting opening **24** of the case main body **2** and according to the present embodiment, the left side of FIG. **1**). The writing tool testing unit **61** is provided within the range where the later described drawing head **42** is able to draw, and the later described writing tool **41** is able to test write. Preferably, the writing tool testing unit **61** is provided to be substantially the same height as the nail T when the print finger Ua is inserted in the finger inserting unit **31**.

The writing tool testing unit **61** has a flat plate shaped portion, and a drawing medium (not shown) inserted from the medium inserting opening **24** of the case main body **2** can be placed on this portion.

The drawing medium placed on the drawing tool testing unit **61** can be any medium with which a pen tip **412** can test write, and includes, for example, a piece of paper.

When the pen tip **412** is dry or the state of ink is not good, the start of drawing tends to be blurred. In order to prevent such situation, in the writing tool testing unit **61**, the writing tool **41** is lowered on the drawing medium before starting drawing on the nail T according to the image data, and the writing tool **41** test writes by drawing a predetermined shape such as a circle or an infinity mark. With this, the pen tip **412** can be in a good state.

The predetermined shape which is drawn in the test writing is not limited. However, in order to prevent wasting ink, it is preferable that the shape is a simple shape such as a circle or an infinity mark.

It is preferable that the test writing of the circle, infinity mark, etc. is drawn shifting within the range of the writing tool testing unit **61** each time the shape is drawn.

When test writing is done on the entire drawing medium, the display unit **26** displays a display screen such as "please replace paper" in order to prompt the user to change the writing medium. In this case, the user takes out the drawing medium from the medium inserting opening **24** and replaces the drawing medium with a new drawing medium. With this, test writing can be done with the new drawing medium. If the drawing medium is a roll of paper, when there is no more space to draw, the drawing medium is rolled out and test writing can be done on the new face of the sheet.

For example, a rubber writing tool cap **62** is provided in the front of the writing tool testing unit **61** (near side in the finger inserting direction) according to the present embodiment. The writing tool cap **62** is provided in a number corresponding to the number of writing tools **41** attached to the drawing unit **40** (according to the present embodiment, 4). When the writing tool **41** is attached to the drawing unit **40** but the drawing is not performed (non-drawn state), the writing tool **41** is stored in the writing tool cap **62**. The region where the writing tool cap **62**, etc. is positioned is to be the home space where the writing tool **41** stands by when in a non-drawn state.

In other words, in a non-drawn state, after the writing tool **41** is moved directly above the writing tool cap **62**, a later described solenoid **440** (see FIG. **4**) lowers the writing tool **41**, and stores the pen tip **412** in the writing tool cap **62**. According to the above, it is possible to prevent the pen tip **412** from drying in a non-drawn state. The shape of the writing tool cap **62** is not limited to the illustrated examples. For example, the writing tool cap **62** can be a long groove shaped writing tool cap which can receive the pen tips **412** of all of the writing tools **41** attached to the drawing unit **40**.

According to the present embodiment, the writing tool cap **62** is provided near the writing tool testing unit **61**. Therefore, when the drawing is started, the writing tool **41** can be lifted and test writing can be done in the writing tool testing unit **61** which is right nearby, and the drawing can be started. Therefore, the time necessary to move the writing tool **41** can be made as short as possible, and prompt drawing operation is possible.

The drawing unit **40** draws on a nail based on the image data of the nail design using a plurality of types of ink. The drawing unit **40** includes a drawing head **42** including a writing tool **41**, a unit supporting member **44** which supports the drawing head **42**, a X-direction moving stage **45** to move the drawing head **42** in the X-direction (X-direction in FIG. **1**, left and right direction of the nail print apparatus **1**), a X-direction moving motor **46**, a Y-direction moving stage **47** to move the drawing head **42** in the Y-direction (Y-direction in FIG. **2**, front and back direction of nail print apparatus **1**), a Y-direction moving motor **48**, and the like.

According to the present embodiment, the drawing head **42** includes four writing tool carriages **43** which each hold one writing tool **41**.

The writing tool **41** which is a drawing tool applies ink on the surface of the nail T to perform drawing.

FIG. **4**A to FIG. **4**C are diagrams which enlarged the writing tool carriage **43** and the writing tool **41** supported by the writing tool carriage **43**, and shows a state when drawing is performed (drawing state).

FIG. **4**A is a side view of the writing tool carriage **43** and the writing tool **41**. FIG. **4**B is an upper view viewing the writing tool carriage **43** and the writing tool **41** shown in FIG. **4**A from an arrow b direction. FIG. **4**C is a front view viewing the writing tool carriage **43** and the writing tool **41** shown in FIG. **4**A from an arrow c direction.

As shown in FIG. **4**A to FIG. **4**C, the writing tool **41** held by the writing tool carriage **43** is provided with the pen tip **412** at the tip of a pen axis portion **411**. Inside the pen axis portion **411** is the ink storing unit which stores various ink. The ink stored inside the pen axis portion **411** is not limited regarding the viscosity, particle diameter of the coloring material (particle size) and the like. For example, ink including gold or silver glitter, white ink, UV curable ink, resin, manicure for under coat and top coat and the like can be used.

A lid portion **414** on which a brim portion **413** projecting outer than the pen axis portion **411** is formed is attached to the other end of the pen axis portion **411**. The material to form the pen axis portion **411** and the lid portion **414** is not limited, and preferably a resin suitable for mass production of the writing tool **41** is used.

According to the present embodiment, a grip portion **415** is provided on the upper portion of the lid portion **414** to easily grip with a hand or tweezers. A small iron piece **416** is buried or attached to the grip portion **415** to be able to attract a magnet.

For example, the writing tool **41** is a pen to perform drawing by pressing the pen tip **412** to the surface of the nail T so that the ink stored in the pen axis portion **411** comes out. The pen tip **412** of the writing tool **41** is a ball point type. The drawing tool **41** is not limited to a ball point type pen, and can be, for example, a pen with a felt pen tip soaked with ink to perform drawing. Alternatively, a brush type pen with a bundle of hair soaked with ink to perform drawing can be used. The pen tip **412** with various thicknesses and shapes can be prepared.

The plurality of writing tools **41** held in each writing tool carriage **43** can be a pen with the same type of pen tip **412** or can be a writing tool with different pen tips **412**.

As described later, the writing tool **41** is simply inserted from the above and held by a writing tool holding unit **437***b* and a writing tool holder **431** of the writing tool carriage **43**. Therefore, the writing tool **41** can be easily replaced by opening the writing tool exchanging lid **23** provided in the case main body **2** and by gripping the grip portion **415** with the hand or tweezers or bringing a pole with a magnet at the tip (not shown) close to the grip portion **415** to attract the iron piece **416** to the magnet to be pulled up. Therefore, the user can realize various nail designs by suitably changing the writing tool **41** attached to each writing tool carriage **43** to the writing tool **41** with different types of pen tip **412** or different types of ink according to the desired nail design.

According to the present embodiment, four writing tool carriages **43** which hold the writing tool **41** are aligned in a width direction (left and right direction, X-direction in FIG. **1**) of the apparatus. Therefore, the position of the pen tip **412** is shifted to the X-direction (left and right direction of the apparatus). The shift is an integral multiplication of one step in the drawing operation, and the drawing is performed correcting the number of steps in the amount of the shift according to the writing tool **41** which is used for drawing. The four drawing tools **41** can perform drawing in the same position.

Each writing tool carriage **43** is provided with a writing tool holder **431** which holds the writing tool **41** substantially vertically and a writing tool raising/lowering mechanism **432** to raise and lower the writing tool **41**.

The writing tool holder **431** is a cylinder portion where the pen tip **412** and the pen axis portion **411** are inserted inside. With this, the writing tool holder **431** holds the writing tool **41**.

The writing tool raising/lowering mechanism **432** includes a solenoid **440** including a plunger **434** and a coil unit **435**, a pin **436** attached to the moving edge side of the plunger **434** of the solenoid **440**, a writing tool raising/lowering lever **437** linked to the plunger **434** through the pin **436**, and a stopper **438** which suppresses the writing tool raising/lowering lever **437** from rising too much.

The solenoid **440** has a mechanism in which the movable plunger **434** moves back and forth like a piston in the coil unit **435** wrapped with copper wire, etc. The plunger **434** is biased to the front (right side direction in FIG. **2** and FIG. **4**A) by the spring **433**, and the solenoid **440** is a pull type solenoid which pulls the plunger **434** toward the back (left side direction in

FIG. **2** and FIG. **4**A) against the bias force of the spring **433**. The solenoid **440** is not limited to a pull type and may be a push type.

As shown in FIG. **4**A, the writing tool raising/lowering lever **437** is a L-shaped member in which a short arm **437***a* and a long arm **437***b* intersect in a substantial right angle, and a long hole **437***c* which is latched to a pin **436** is formed at the tip side of the short arm **437***a*.

A writing tool holding unit **437***d* in which the writing tool **41** is inserted is provided on the tip side of the long arm **437***b*. The writing tool holding unit **437***d* is formed in a ring shape with an inner diameter larger than the diameter of the pen axis portion **411** and the pen tip **412** of the writing tool **41** and smaller than the diameter of the brim portion **413** of the pen axis portion **411**. The pen axis portion **411** and the pen tip **412** are inserted in the writing tool holding unit **437***d*. The writing tool holding unit **437***d* hooks to the brim portion **413** to support the brim portion **413** from the lower side.

A rotating axis **439** is inserted through the crossing point between the short arm **437***a* and the long arm **437***b* in the writing tool raising/lowering lever **437** from the writing tool carriage **43** side.

According to the present embodiment, when the solenoid **440** is driven, as shown in FIG. **4**A, the plunger **434** is pulled to the back against the bias force of the spring **433**, and the writing tool raising/lowering lever **437** latched to the pin **436** of the plunger **434** is maintained in a position where the long arm **437***b* is substantially horizontal. In this state, the pen tip of the writing tool **41** is lowered to a state lower than the writing tool holder **431** of the writing tool carriage **43** and is in a drawing state which can come into contact with the surface of the nail T or the drawing medium.

When the solenoid **440** is free, the plunger **434** projects forward with the bias force of the spring **433**. The writing tool raising/lowering lever **437** latched to the pin **436** of the plunger **434** rotates around the rotating axis **439** as the fulcrum in the upper direction (counter clockwise direction), and the long arm **437***b* comes into contact with the stopper **438** and stops. With this, the brim portion **413** of the writing tool **41** is thrown up by the writing tool raising/lowering lever **437** (see FIG. **2**). In this state, the pen tip of the writing tool **41** is lifted higher than the writing tool holder **431** of the writing tool carriage **43** and is in a non-drawn state not in contact with the surface of the nail T or the drawing medium.

The force to move the plunger **434** of the solenoid **440** front and back is converted to the force to move the writing tool **41** up and down with the rotating axis **439** and the writing tool raising/lowering lever **437** rotating around the rotating axis **439** as the fulcrum.

The writing tool **41** is simply held inserted through the writing tool holder **431** of the writing tool carriage **43**, and is not fixed to the writing tool raising/lowering lever **437**, etc. Therefore, the writing tool **41** is biased toward the bottom by its own weight. With this, the writing tool **41** can lower itself freely along the writing tool holder **431** to the position where the brim portion comes into contact with the upper surface of the writing tool holding unit **437***d*. Moreover, when the writing tool **41** hits the surface of the nail T or the drawing medium, the pen tip **412** is pressed to the surface of the nail T and the drawing medium.

In other words, when drawing is performed with the drawing tool **41** on the nail T, the pen tip **412** is able to move freely in the Z direction (in other words, up and down direction) orthogonal to the XY plane where the print finger ha is placed, so as to follow (according to the curve and the height of the nail T) the shape of the surface of the nail T (up and down the surface).

For example, when drawing is performed in the portion where the height of the nail T is low (for example, both edge portions of the nail T in the width direction), the writing tool **41** is lowered to a position where the brim portion **413** comes into contact with the upper surface of the writing tool holding unit **437***d*. When drawing is performed in the portion where the height of the nail T is high (for example, center portion of the nail T in the width direction), the writing tool **41** is raised following the height of the nail T, and the brim portion **413** is separated from the upper surface of the writing tool holding unit **437***d*.

The weight of the writing tool **41** is a few grams to a few tens of grams and very light. Therefore, even if the pen tip **412** hits the nail T, the user does not feel pain. The pressure of the pen is maintained by the weight of the writing tool **41**, and it is possible to draw a nail design on the nail T.

According to the present embodiment, among the members which compose the writing tool raising/lowering mechanism **432**, the rotating axis **439** and the stopper **438** are formed from metal such as stainless steel. The other members are formed from material which are light and do not react to magnets, such as resin, etc. The material of the members which compose the writing tool raising/lowering mechanism **432** is not limited to the examples described above.

According to the present embodiment, a solenoid **440** is used as the actuator to raise and lower the writing tool **41**. However, the actuator to raise and lower the writing tool **41** is not limited to the solenoid **440**. Since the writing tool **41** is light in weight, other than the solenoid, other various small driving apparatuses can be used as the actuator to raise and lower the writing tool **41**.

The unit supporting member **44** which supports the drawing head **42** is fixed to the X-direction moving unit **451** which is attached to the X-direction moving stage **45**. The X-direction moving unit **451** moves in the X-direction along a guide not shown on the X-direction moving stage **45** driven by the X-direction moving motor **46**. With this, the drawing head **42** moves in the X-direction (X-direction in FIG. **1**, left and right direction of the nail print apparatus **1**).

The X-direction moving stage **45** is fixed to the Y-direction moving unit **471** of the Y-direction moving stage **47**. The Y-direction moving unit **471** moves along the guide (not shown) in the Y-direction on the Y-direction moving stage **47** driven by the Y-direction moving motor **48**. With this, the drawing head **42** moves in the Y-direction (Y-direction in FIG. **2**, front and back direction of nail print apparatus **1**).

According to the present embodiment, the X-direction moving stage **45** and the Y-direction moving stage **47** are configured by combining the X-direction moving motor **46**, the Y-direction moving motor **48**, and ball screws and guides which are not shown. A step motor which moves a predetermined amount for each pulse that is transmitted is applied to the X-direction moving motor **46** and the Y-direction moving motor **48** of the present embodiment.

According to the present embodiment, the head driving unit **49** (see FIG. **5**) is composed of the X-direction moving motor **46** and the Y-direction moving motor **48** to drive the drawing head **42** including the writing tool **41** to draw on the nail T in the X-direction and the Y-direction.

The solenoid **440** to move the writing tool **41** in the drawing unit **40** up and down, the X-direction moving motor **46**, and the Y-direction moving motor **48** are connected to a later described drawing control unit **816** of a control apparatus **80** (see FIG. **5**), and the above members are controlled by the drawing control unit **816**.

As shown in FIG. **1** and FIG. **2**, a capturing unit **50** is provided in the upper machine frame **12**.

In other words, a substrate **13** is provided in the upper machine frame **12**, and two cameras **51** as the imaging apparatus are provided in the lower face of the center portion of the substrate **13**. Preferably, the camera **51** includes, for example, 2 million pixels or more.

The camera **51** captures the nail T of the print finger Ua inserted in the finger inserting unit **31**, and obtains a nail image (finger image including image of nail T) which is an image of the nail T of the print finger Ua.

According to the present embodiment, the two cameras **51** are provided substantially aligned in the width direction of the nail T of the print finger Ua inserted in the finger inserting unit **31**. Among the two cameras **51**, one camera **51** is provided facing the base of the finger inserting unit **31** and captures the nail T from directly above.

The other camera **51** is positioned slightly tilted from the base of the finger inserting unit **31** and captures the nail T from diagonally above.

Illuminating lamps (illuminating apparatus) **52** such as white LED are positioned to surround the camera **51** on the substrate **13**. The illuminating lamp **52** illuminates the nail T of the print finger Ua when the capturing is performed by the camera **51**. The capturing unit **50** includes the camera **51** and the illuminating lamp **52**.

The capturing unit **50** is connected to the later described capturing control unit **811** of the control apparatus **80** (see FIG. **5**) and the capturing control unit **811** controls the capturing unit **50**.

The image data of the image captured by the capturing unit **50** is stored in a later described nail image storage region **821** of the storage unit **82**.

According to the present embodiment, the nail T can be captured from at least two different, positions and angles with the two cameras **51** as the imaging apparatus, and at least two nail images are obtained.

Based on the above nail images, a later described nail information detecting unit **812** is able to detect information regarding the nail such as the outline of the nail T (shape of the nail T), the tilting angle of the surface of the nail T with respect to the XY plane (hereinafter referred to as "tilting angle of nail T" or "nail curvature"), the vertical position of the nail T and the like. In other words, for example, by taking in the image of the nail T from directly above and the image of the nail T from diagonally above, it is possible to accurately detect not only the outline of the nail T but also the position and the tilting angle of the surface of the nail T.

The configuration including two cameras **51** as the imaging apparatus to be able to detect the tilting angle of the nail T or the nail curvature is not essential. Alternatively, the nail T can be captured from only the above and the outline of the nail T (shape of the nail T) can be detected as the nail information.

For example, the control apparatus **80** is positioned on the substrate **13** placed in the upper machine frame **12**.

FIG. **5** is a main section block diagram showing a control configuration according to the present embodiment.

As shown in FIG. **5**, the control apparatus **80** is a computer including a control unit **81** composed of the CPU (Central Processing Unit) and a storage unit **82** composed of a ROM (Read Only Memory) and a RAM (Random Access Memory) (all not shown).

Various programs to operate the nail print apparatus **1** and various pieces of data are stored in the storage unit **82**.

Specifically, various programs are stored in the ROM of the storage unit **82**, such as a nail information detecting program to detect nail information such as the shape of the nail T from the nail image, drawing data generating program to generate drawing data, drawing program to perform drawing processing and the like. Each unit of the nail print apparatus **1** is centrally controlled by the control apparatus **80** executing the above program.

The storage unit **82** of the present embodiment is provided with a nail image storage region **821** which stores the nail image of the nail T of the print finger Ua of the user obtained by the capturing unit **50**, a nail information storage region **822** which stores nail information detected by the nail information detecting unit **812**, a nail design storage region **823** which stores image data of a nail design drawn on the nail T, and a table storage region **824** which stores various data tables.

According to the present embodiment, the surface of the nail T of the print finger Ua is the drawing target region to be drawn by the drawing unit **40**, and a plurality of unit regions ar are set in the drawing target region.

Here, each unit region ar is a connected region drawn with the same type of ink. Even if the regions are drawn with the same type of ink, if the regions are apart, the regions are set as different unit regions ar.

According to the present embodiment, when the user selects the nail design, the unit region ar to print the nail design is set for all of the nails T on which the nail design is to be drawn in a string of drawing processing and an area number (hereinafter referred to as "area No") is applied in advance to each unit region ar. The area No is applied as a consecutive number to all of the unit regions ar regardless of the type of nail T (type of finger).

Here, the string of drawing processing is a string of processing in which drawing is performed successively on all of the nails T set by the user in advance as the nails T on which drawing is performed. For example, when the user sets drawing on all of the nails T on the left hand and the right hand, drawing the nail design selected by the user on all nails T of the 10 fingers is the string of drawing processing.

According to the present embodiment, to simplify description, the example illustrated below is an example in which drawing is performed on nails T of 5 fingers (U**1** to U**5** shown in FIG. **6**) of one hand using 2 types of ink.

In this case, as shown in FIG. **6**, for example, 2 unit regions ar are set for each of the 5 nails T as the drawing target. Area No (ar**1** to ar**10** in FIG. **6**) are applied as consecutive numbers to the 10 unit regions ar.

According to the present embodiment, the following tables are stored in the table storage region **824**, a shape data table **831**, a unit region information table **832**, a priority order table **833**, a drying time table **834**, a surrounding relation table **835**, a drawing data table **836**, and a progress management table **837**.

As described later, the shape of each nail T of each finger U**1** to **05** is detected by the nail information detecting unit **812**. The shape of the detected nail T is stored in the nail information storage region **822** as shape data composed of, for example, x-coordinate and y-coordinate information and in the shape data table **831** of the table storage region **824**.

Table 1 is one example of the shape data table **831** when the nail design shown in FIG. **6** is drawn.

TABLE 1

FINGER No	SHAPE DATA
U1	SHAPE 1
U2	SHAPE 2
U3	SHAPE 3
U4	SHAPE 4
U5	SHAPE 5

As shown in Table 1, shape **1** to shape **5** of the nail T of each finger U**1** to U**5** are registered associated with the finger No (in other words, U**1** to U**5**) of each print finger Ua in the shape data table **831**. In the shape data table **831**, the shape data itself can be stored or identification information to link with the shape data of each nail T stored in the nail information storage region **822** can be stored.

Table 2 shows one example of the unit region information table **832**.

TABLE 2

FINGER No	AREA No	AREA No
U1	1	2
U2	3	4
U3	5	6
U4	7	8
U5	9	10

As shown in Table 2, the unit region information table **832** associates the finger No of each print finger Ua (in other words, U**1** to U**5**) with the area No (ar**1** to ar**10** in Table 2) of the unit region ar set in each print finger Ua.

The unit region information table **832** manages where each of the plurality of unit regions an is in each nail T. The table storage region **824** which stores the unit region information table **832** functions as the unit region information storage unit.

When the later-described drawing control unit **816** performs the drawing control processing, the drawing control unit **816** checks whether drawing is possible on each unit region ar in order starting from those with the high priority order set in advance.

Table 3 shows one example of a priority order table **833**.

TABLE 3

AREA No	PRIORITY ORDER
1	1
2	6
3	2
4	7
5	3
6	8
7	4
8	9
9	5
10	10

The priority order table **833** associates the area No of the unit region ar (ar**1** to ar**10** in Table 3) with the priority order of each unit region ar. The priority order table **833** is set so that unit regions an in contact with each other are not in continuing orders.

For example, according to the present embodiment, as shown in Table 3, the order of the unit region ar set in the same nail T of the print finger Ua (for example, unit regions an and ar**2** set on the nail T of the finger U**1**) is set so as not to continue. The unit regions ar of the nail tip portion of the fingers U**1** to U**5** (in other words, ar**1**, ar**3**, ar**5**, ar**7**, and ar**9** in FIG. **6**) are set with the priority order first to fifth in order from the small finger No (in other words, in the order of finger No U**1** to U**5** in FIG. **6**). The unit regions ar of the nail root portion of the fingers U**1** to U**5** (in other words, ar**2**, ar**4**, ar**6**, ar**8**, and ar**10** in FIG. **6**) are set with the priority order sixth to tenth in order from the small finger No (in other words, in order of finger No U**1** to U**5** in FIG. **6**). The method of applying the priority order is not limited to the method illustrated here and can be suitably set considering the area of each unit region ar and the type of ink to be applied.

Table 4 shows an example of the drying time table **834**.

TABLE 4

AREA No	SET VALUE OF DRYING TIME [sec]
1	20
2	30
3	20
4	30
5	20
6	30
7	20
8	30
9	20
10	30

As shown in Table 4, the drying time table **834** associates the unit region ar with the drying time which is set a time required for completion of drying of the ink applied to each unit region ar. The drying time for each region in each nail design is included in the information of the image data of each nail design, and the drying time in the drying time table **834** is set based on the information included in the image data.

For example, according to Table 4, the drying time of the unit region ar of area No **1** (unit region ar**1** in FIG. **6**) is set to 20 seconds, and the drying time of the unit region ar of area No **2** (unit region ar**2** in FIG. **6**) is set to 30 seconds.

The ease of drying changes depending on the composition and the viscosity of the ink. Therefore, the drying time for each unit region ar is set considering the difference of the ease of drying according to type of ink (color) applied to the unit region ar.

Table 5 shows an example of the surrounding relation table **835**.

TABLE 5

AREA No	SET VALUE OF ADJACENT REGION
1	2
2	1
3	4
4	3
5	6
6	5
7	8
8	7
9	10
10	9

As shown in Table 5, the surrounding relation table **835** associates the area No of each unit region ar with the area No of the unit region ar in contact with each unit region ar (hereinafter referred to as "adjacent region") based on the image data.

According to the present embodiment, the unit regions ar set in the nail T of the same print finger Ua are the adjacent regions (for example, the unit regions ar**1** and ar**2** set in the nail T of the finger U**1**). Therefore, for example, according to Table 5, the unit region ar of area No **2** is associated with the unit region ar of area No **1** as the adjacent region and the unit region ar of area No **1** is associated with the unit region ar of area No **2** as the adjacent region.

Table 6 shows an example of the drawing data table **836**.

TABLE 6

AREA No	DRAWING DATA
1	DRAWING DATA 1
2	DRAWING DATA 2
3	DRAWING DATA 1
4	DRAWING DATA 2
5	DRAWING DATA 1
6	DRAWING DATA 2
7	DRAWING DATA 1
8	DRAWING DATA 2
9	DRAWING DATA 1
10	DRAWING DATA 2

As shown in Table 6, the drawing data table **836** associates the area No of each unit region ar with the drawing data of the image drawn in each unit region ar of each area No.

The example described here shows the area No of each unit region ar stored in the storage region different from the image data itself of the image drawn in each unit region ar (according to the present embodiment, image data of the nail design stored in the nail design storage region **823**). Alternatively, the area No can be positioned at the top, bottom or the like of each piece of the image data of the unit region ar.

Tables 7 to 11 show examples of the progress management table **837**.

TABLE 7

AREA No	DRAWING STATUS	DRYING TIME [sec]
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0

TABLE 8

AREA No	DRAWING STATUS	DRYING TIME [sec]
1	1	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0

TABLE 9

AREA No	DRAWING STATUS	DRYING TIME [sec]
1	9	20
2	0	0
3	1	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0

TABLE 9-continued

AREA No	DRAWING STATUS	DRYING TIME [sec]
9	0	0
10	0	0

TABLE 10

AREA No	DRAWING STATUS	DRYING TIME [sec]
1	9	0
2	1	0
3	9	5
4	0	0
5	9	10
6	0	0
7	9	15
8	0	0
9	9	20
10	0	0

TABLE 11

AREA No	DRAWING STATUS	DRYING TIME [sec]
1	9	0
2	9	30
3	9	3
4	1	0
5	9	8
6	0	0
7	9	13
8	0	0
9	9	18
10	0	0

As shown in Tables 7 to 11, the progress management table **837** associates the drawing status and the drying time with the unit region ar of each area No.

Here, the drawing status is any one of non-drawn state, drawing in progress, or drawing complete. According to Tables 7 to 11, "0" is set to the unit region ar in a non-drawn state, "1" is set to the unit region ar in which drawing is in progress, and "9" is set to the unit region ar in which drawing is complete.

The progress management table **837** is suitably updated according to the progress status of the drawing processing.

For example, before drawing starts, as shown in Table 7, the drawing status in all unit regions ar is "0" showing the non-drawn state, and the drying time is also set to "0". When the drawing starts in the unit region ar of area No **1** which is first in the priority order, as shown in Table 8, the drawing status of area No **1** is set to "1" showing drawing is in progress. When the drawing in the unit region ar of area No **1** ends and the drawing in the unit region ar of area No **3** next in the priority order starts, as shown in Table 9, the drawing status of area No **1** is set to "9" showing drawing is complete, and the drawing status of area No **3** is set to "1" showing drawing is in progress.

The drying time of the area No **1** in which drawing is complete is set to 20 seconds. As shown in Tables 10 and 11, the drying time reduces as time passes reflecting the result of time kept by a later described drying notifying timer **83**.

Functionally, the control unit **81** includes, a capturing control unit **811**, a nail information detecting unit **812**, a nail specifying unit **813**, a nail judging unit **814**, a drawing data

generating unit **815**, a drawing control unit **816**, a display control unit **817**, and the like. Such functions as the capturing control unit **811**, the nail information detecting unit **812**, the nail specifying unit **813**, the nail judging unit **814**, the drawing data generating unit **815**, the drawing control unit **816**, the display control unit **817**, and the like are realized by the CPU of the control unit **81** in coordination with the program stored in the ROM of the storage unit **82**.

According to the present embodiment, the drying notifying timer **83** is connected to the control unit **81**.

When drying starts in the unit region ar, the value of the drying time associated with the area No corresponding to the unit region ar is set in the drying notifying timer **83** based on the drying time table **834** as shown in Table 4 (drying time required for completion of drying of the ink as defined in the drying time table **834** of Table 4) and counting of the elapsed time starts.

According to the present embodiment, the point of time when the drawing of one unit region ar ends and the print finger Ua where the unit region ar on which drawing is performed next belongs is inserted in the finger inserting unit **31** is when the drying notifying timer **83** starts counting as the point of time when the drying of the unit region ar on which drawing is performed starts. The point of time when the drying starts is not limited to this point. Alternatively, for example, a sensor or a camera can be provided in the finger shelter unit **32** to detect the point of time when the finger of the nail T on which drawing is performed is inserted in the finger shelter unit **32**, and this can be the point of time when the drying starts.

When the counted elapsed time reaches the drying time required for completion of drying of the ink of the unit region ar, the drying notifying timer **83** outputs a drying time end signal to the control unit **81**, and notifies the above to the control unit **81**.

For example, when the drawing of the unit region ar**1** ends and the finger U**2** where the unit region ar**3** on which the next drawing is performed belongs is inserted in the finger inserting unit **31**, at this point of time, the drying time "20 seconds" necessary to dry the ink of the unit region ar**1** is set in the drying notifying timer **83**, and the drying notifying timer **83** starts counting the elapsed time from when the drying starts. After 20 seconds pass, the drying time end signal is output from the drying notifying timer **83** to the control unit **81**, and the control unit **81** is notified that the predetermined drying time of "20 seconds" has passed.

When the control unit **81** is notified that the predetermined drying time has passed from the drying notifying timer **83**, the drying time of the unit region ar is set to "0" in the progress management table **837**.

The control unit **81** can suitably obtain the elapsed time counted by the drying notifying timer **83** and update the item of the drying time of each unit region ar in the progress management table **837**.

The capturing control unit **811** controls the camera **51** and the illuminating lamp **52** of the capturing unit **50** to capture the image of the finger including the image (hereinafter referred to as "nail image") of the nail T of the print finger Ua inserted in the finger inserting unit **31** with the camera **51**.

According to the present embodiment, the capturing control unit **811** obtains at least 2 nail images from different positions and angles (for example, above the nail T and diagonally above the nail T) with the 2 cameras **51**.

The image data of the nail image obtained by the capturing unit **50** can be stored in the storage unit **82**.

The nail information detecting unit **812** detects the nail information of the nail T of the print finger Ua based on the image of the nail T of the print finger Ua inserted in the finger inserting unit **31** captured by the camera **51**.

For example, here, the nail information includes, the outline of the nail T (nail shape, horizontal position of the nail T), the tilting angle of the surface of the nail T with respect to the XY plane (tilting angle of the nail T, nail curvature), and the height of the nail T (position of the nail T in the vertical direction, hereinafter referred to as "vertical position of nail T", or simply "position of nail T"). The tilting angle of the nail T (nail curvature) is the angle with respect to the horizontal plane in the width direction of the nail T (for example, the XY plane of the finger placing unit **116***a* where the print finger Ua is placed).

Specifically, the nail information detecting unit **812** detects the outline of the nail T (shape and size) and position from the nail image of the nail T of the print finger Ua obtained by the camera **51**. The outline is obtained as information represented by x and y coordinates. For example, the nail information detecting unit **812** detects the outline (shape) of the nail T based on the difference in color between the nail T and other portions of the finger from the nail image of the nail T of the print finger Ua obtained by the camera **51**. The method of how the nail information detecting unit **812** detects the outline (shape) of the nail T is not limited to the method as described above, and is not limited to methods illustrated here.

The nail information detecting unit **812** functions as the tilting angle detecting unit which detects the tilting angle (nail curvature) of the nail T based on the at least 2 nail images captured by the 2 cameras **51**.

For example, the nail information detecting unit **812** detects the tilting angle (nail curvature) of the nail T of the user from the 2 nail images captured from different positions and angles (for example, above the nail T and diagonally above the nail T) by the 2 cameras **51**. The method of how the nail information detecting unit **812** detects the tilting angle (nail curvature) of the nail T is not limited to the above, and is not limited to methods illustrated here.

The nail information detecting unit **812** is to at least detect the outline of the nail T (nail shape) based on the nail image, and does not have to obtain all of the above pieces of nail information.

The nail specifying unit **813** specifies the nail T (specific nail which is a print finger Ua including the nail T) including a non-drawn unit region ar (hereinafter referred to as "specific unit region") with all of the adjacent regions ar being at least either the dried unit region ar in which the ink is applied and the drying of the ink is completed or the non-drawn unit region ar in which the ink is not yet applied as the nail T (specific nail which is a print finger Ua including the nail T) to be positioned in the finger inserting unit **31** which is the drawing position. In other words, specific unit region is one of the non-drawn unit regions which are not in contact with a non-dried unit region ar in which the ink is applied and the drying of the ink is not completed.

According to the present embodiment, the nail specifying unit **813** determines the unit region ar on which drawing is performed next according to the priority order based on the priority order table **833** and judges whether drawing can be performed in the unit region ar.

The nail specifying unit **813** refers to the progress management table **837** to judge whether drawing is possible. The nail specifying unit **813** judges that the drawing on the unit region ar is possible when the drawing status of the unit region ar in the progress management table **837** is "0" (in other words, non-drawn state) and the drawing status of the unit region ar which is the adjacent region of the above unit region ar in the

surrounding relation table **835** is "0" (in other words, non-drawn state) or "9" (in other words, drawing is complete) and the drying time is "0".

When the drawing is possible, the nail specifying unit **813** specifies the finger No corresponding to the nail T where the unit region ar belongs based on the unit region information table **832**.

When the finger No of the nail T where the specific unit region belongs is specified, an instruction to urge the user to insert the print finger Ua of the finger No (for example, if the print finger Ua is finger No**3** shown in FIG. **6**, the middle finger) in the finger inserting unit **31** is displayed on the display unit **26**. Specifically, the nail specifying unit **813** displays an instruction to the user on the display unit **26** with the display control unit **817**.

When the user positions the print finger Ua in the finger inserting unit **31** which is the drawing position, the nail judging unit **814** judges whether the nail T specified by the nail specifying unit **813** is positioned in the finger inserting unit **31**.

Specifically, when the print finger Ua is positioned in the finger inserting unit **31**, the capturing unit **50** captures the nail image and the shape of the nail T is detected by the nail information detecting unit **812** based on the nail image. The nail judging unit **814** judges whether the inserted nail T is the nail T of the print finger Ua of the finger No specified by the nail specifying unit **813** based on the shape of the nail T detected by the nail information detecting unit **812** and the nail shape of each finger U**1** to U**5** registered in advance in the shape data table **831**.

According to the present embodiment, when the nail judging unit **814** judges that the nail T positioned in the finger inserting unit **31** is not the nail T of the print finger Ua of the finger No specified by the nail specifying unit **813**, the above is displayed on the display unit **26** and an instruction screen to urge the user to position the correct nail T is displayed on the display unit **26**.

The drawing data generating unit **815** generates drawing data to draw on the nail T of the print finger Ua with the drawing head **42** based on the nail information such as the nail shape detected by the nail information detecting unit **812**.

Specifically, the drawing data generating unit **815** performs matching processing by enlarging, reducing, cutting, etc. the image data of the nail design based on the shape of the nail T detected by the nail information detecting unit **812**, and generates the data for drawing on the nail T. When the nail information detecting unit **812** obtains the tilting angle (nail curvature) of the nail T as the nail information, the drawing data generating unit **815** corrects the curved surface of the image data of the nail design according to the tilting angle (nail curvature) of the nail T.

When there is a unit region ar already drawn on the nail T (drawn region), the drawing data generating unit **815** generates the drawing data based on the nail shape of the nail T and the shape of the drawn unit region ar. In this case, fitting processing is performed according to the image data of the nail design. For example, when the image data shows that the region needs to be in contact with the drawn region, the regions are in contact without space in between. When the image data shows that a space is necessary between the region and the drawn region, a space is made in between.

The drawing control unit **816** is a control unit which outputs drawing data generated by the drawing data generating unit **815** to the drawing unit **40**, and controls the solenoid **440** of the drawing unit **40**, the X-direction moving motor **46**, and the Y-direction moving motor **48** to draw according to the drawing data on the nail T.

According to the present embodiment, the drawing control unit **816** controls the drawing operation of the drawing unit **40** to draw each unit region ar.

Specifically, the drawing control unit **816** controls the drawing operation of the drawing unit **40** to draw on the specific unit region of the nail T specified by the nail specifying unit **813** (non-drawn unit region ar with all of the adjacent unit regions ar being at least either the dried unit region ar in which the ink is applied and the drying of the ink is completed, or the non-drawn unit region ar in which the ink is not applied).

The display control unit **817** controls the display unit **26** and displays various display screens on the display unit **26**. According to the present embodiment, the display control unit **817** displays various screens on the display unit **26** such as the selection screen of the nail design, the thumbnail image for confirming the design, the nail image capturing the print finger Ua including the nail T and the like.

When the nail T belonging to the unit region ar on which the image is to be drawn is specified by the nail specifying unit **813**, the instruction screen instructing the user to insert the print finger Ua corresponding to the nail T in the finger inserting unit **31** is displayed on the display unit **26**.

Next, with reference to FIG. **7** to FIG. **9**, the operation of the nail print apparatus **1** and the method of printing according to the present embodiment are described.

When drawing is performed with the nail print apparatus **1**, first, the user turns on the power switch and starts the control apparatus **80**.

The display control unit **817** displays the design selection screen on the display unit **26**. The user operates the operating button **251**, etc. of the operating unit **25** to select the desired nail design from the plurality of nail designs displayed on the design selecting screen. With this, the selecting instruction signal is output from the operating unit **25**, and as shown in FIG. **7**, the nail design to be drawn on the nail T is selected (step S**1**).

When the nail design is selected, the control unit **81** displays an instruction screen on the display unit **26** to urge the user to successively insert in the finger inserting unit **31** all of the print fingers Ua which the user desires drawing (step **92**). Preferably, for example, the type of print finger Ua to be inserted is instructed, such as "please first insert thumb" or the order of the print finger Ua to be inserted is instructed on the instruction screen, such as "please insert fingers in the following order, thumb, index finger, middle finger, ring finger, and little finger".

When the user inserts the print finger Ua in the finger inserting unit **31** according to the instruction, the capturing control unit **811** controls the capturing unit **50**, and the print finger Ua is captured by the camera **51** while the print finger Ua is illuminated by the illuminating lamp **52**. With this, the image of the nail T (nail image) of the print finger Ua inserted in the finger inserting unit **31** is obtained by the capturing unit **50** (step S**3**).

Next, the nail information detecting unit **812** detects the nail information of the outline (nail shape), etc. of the nail T of each print finger Ua based on the nail image of each print finger Ua obtained by the capturing unit **50** (step S**4**).

The nail information detected by the nail information detecting unit **812** is stored in the nail information storage region **822** and registered in the shape data table **831** corresponded with the finger No determined by the inserting order, etc. of the print finger Ua (step S**5**).

When the nail information is obtained for all of the print fingers Ua on which the image is drawn, the drawing processing is performed (step S**6**).

As shown in FIG. **8**, according to the drawing processing of the present embodiment, the nail specifying unit **813** judges the unit region ar on which drawing is performed first, and specifies the finger No of the print finger Ua corresponding to the unit region ar.

Specifically, the nail specifying unit **813** obtains the unit region on which drawing is performed from the priority order table **833** (step S**11**).

When the unit region ar is selected according to the priority order table **833**, the nail specifying unit **813** judges whether the unit region ar is a non-drawn state by referring to the progress management table **837** (step S**12**). When drawing is already performed on the selected unit region ar (step S**12**; NO), the processing returns to step S**11** and the unit region ar in the next priority order is selected from the priority order table **833**.

When drawing is not yet performed on the selected unit region ar (step S**12**; YES), the nail specifying unit **813** refers to the surrounding relation table and specifies the adjacent region adjacent to the unit region ar (step S**13**). When the adjacent region is specified, the progress management table **837** is referred, and it is judged whether drawing is not yet performed on the adjacent region or drawing is already performed and the drying time is "0" and drying is completed (step S**14**). When it is judged that drawing is performed on the adjacent region but the drying time is not "0" (step S**14**; NO), the processing returns to step S**11**, and the unit region ar next in the priority order is selected from the priority order table **833**.

When it is determined that the drawing is not yet performed on the adjacent region or the drawing is already performed and the drying time is "0" (step S**14**; YES), the nail specifying unit **813** refers to the unit region information table **832** and specifies the nail T where the selected unit region ar belongs (step S**15**). Then, an instruction is displayed on the display unit **26** to position the print finger Ua where the nail T belongs in the finger inserting unit **31** and to operate the drawing start switch (step S**16**).

The user positions the print finger Ua specified by the instruction in the finger inserting unit **31**, the other fingers are evacuated to the finger shelter unit **32**, and the drawing start switch (not shown) of the operating unit **25** is operated.

The control unit **81** judges whether the drawing start switch is operated (step S**17**). When the drawing start switch is operated (step S**17**; YES), the nail T set in the finger inserting unit **31** is captured, and the nail shape, etc. is detected based on the captured nail image (step S**18**). The nail judging unit **814** compares the detected nail shape with the shape data table **831** and judges whether the correct nail T according to the instruction is positioned in the finger inserting unit **31** (step S**19**).

When the drawing start switch is not operated (step S**17**; NO), or the nail T positioned in the finger inserting unit **31** is not the instructed nail T (step S**19**; NO), the processing returns to step S**16** and the instruction to place the instructed nail T in the finger inserting unit **31** and operate the drawing start switch is repeated.

When the nail judging unit **814** judges that the nail T positioned in the finger inserting unit **31** is the instructed nail T (step S**19**; YES), the following drawing process is started.

Even if the drawing start switch is not operated, when the nail T set in the finger inserting unit **31** is acknowledged and it is judged that the correct nail T according to the instruction is set compared to the shape data table **831**, if the nail T is still for about 1 second after the nail T is placed, the setting of the nail T can be considered to be finished and the same operation as operating the drawing start switch can be performed.

As shown in FIG. **9**, when the instructed nail T is positioned, the control unit **81** judges whether the drawn unit region ar is included in the nail T (step S**20**). When the drawn unit region ar is included (step S**20**; YES), the drawing data generating unit **815** fits the image data of the nail design based on the nail shape and the shape of the drawn unit region ar and generates the drawing data (step S**21**).

When the drawn unit region ar is not included (step S**20**; NO), the drawing data generating unit **815** fits the image data of the nail design based on the nail shape of the nail T and generates the drawing data (step S**22**). Here, the state of fitting can be displayed on the display unit **26** and confirmed by the user.

When the drawing data generating unit **815** generates the drawing data, the drawing control unit **816** outputs the drawing data to the drawing unit **40**, drives the solenoid **440** of the writing tool carriage **43** holding the writing tool **41** necessary for drawing so that the drawing tool **41** is able to draw, and the drawing head **42** is suitably moved in the XY direction based on the drawing data to draw the nail design on the nail T (step S**23**). Here, the writing tool **41** is pressed on the surface of the nail T by its own weight and drawing is performed by moving up and down following the shape of the surface of the nail T.

When the drawing starts, the control unit **81** refers to the progress management table **837** and judges whether the nail T is not dry (in other words, whether the drying time of the nail T is not yet "0") (step S**24**). When the nail T is not dry (step S**24**; YES), the drying apparatus **27** (for example, fan) is turned ON (step S**25**). When the drawing is performed successively, the drying apparatus **27** may already be turned ON, and in this case the ON state is maintained. When the nail T is not a not dry nail (step S**24**; NO), the drying apparatus **27** (for example, fan) is turned OFF (step S**26**). After the drying apparatus **27** is turned on at the start of the string of drawing processing, the drying apparatus **27** can be maintained in the ON state until the drawing and drying of all nails T end.

The control unit **81** turns on the drying notifying timer **83** and starts counting the elapsed time from the start of drying of the unit region ar on which drawing was performed just before (step S**27**). The result of time counted by the drying notifying timer **83** is reflected on the progress management table **837**. In other words, according to the present embodiment, when the drawing of the unit region ar is performed and the nail T where the unit region ar on which the next drawing is performed belongs is placed in the finger inserting unit **31**, the drawing status of the unit region ar on which drawing was performed just before is set to drawing complete, "9", in the progress management table **837**, and the drying time required for completion of drying of the ink of the unit region ar is set to the drying time in the progress management table **837**. The value of the drying time is reduced to "0" according to the result of time counted by the drying notifying timer **83**.

The control unit **81** refers to the progress management table **837** and judges whether the drawing of all unit regions ar is performed (step S**28**). When it is not performed (step S**28**; NO), the processing returns to step S**11**, the next unit region ar on which drawing is performed is selected, and the processing is repeated.

When the drawing of all unit regions ar ends (step S**28**; YES), the control unit **81** refers to the progress management table **837** and judges whether the drying of all unit regions ar is completed (step S**29**). When the drying is not yet completed (step S**29**; NO), the ON state of the drying apparatus **27** is maintained and the judgment of step S**29** is repeated.

When the drying of all unit regions ar is completed (step S**29**; YES), the drying apparatus **27** is turned OFF and the string of drawing processing ends.

As described above, according to the present embodiment, the nail T with a specific unit region on which drawing is not performed yet and the adjacent unit regions ar are all at least either a dried unit region ar in which ink is applied and the drying of the ink is completed or non-drawn unit region ar on which ink is not applied is specified as the nail T to be positioned in the drawing position and drawing is performed in the unit region ar (specific unit region) of the nail T positioned in the drawing position according to the above specification.

With this, when the nail design is drawn on the plurality of finger nails T, it is possible to prevent the ink mixing in the boundaries of regions drawn with different ink without the user having to judge the drying state of the ink, etc. and highly fine nail print can be performed.

The control unit **81** judges the region where ink does not get mixed and determines the next drawing region. Therefore, it is possible to make the standby time waiting for the ink to dry as short as possible. With this, fast drawing processing can be achieved while maintaining the quality of drawing.

According to the present embodiment, the nail information detecting unit **812** detects the shape of the nail T positioned in the drawing position and judges whether the correct nail T specified by the nail specifying unit **813** is positioned in the drawing position based on the shape of the nail T detected by the nail judging unit **814**. When the nail T positioned in the drawing position is not the nail T specified by the nail specifying unit **813**, it is displayed on the display unit **26**. Therefore, the user is able to realize that the wrong finger is inserted in the finger inserting unit **31** before drawing starts and it is possible to prevent drawing on the nail T with undried regions by mistake.

The drying notifying timer **83** counts the elapsed time from the start of drying and notifies the progress of the drying time. Therefore, only the unit region ar in which the drying time passed is reliably set as the dried unit region ar, and the judgment of the unit region ar on which drawing can be performed can be accurately performed.

The drawing unit **40** includes the writing tool **41** with a tip which comes into contact with the surface of the nail T and performs drawing. Therefore, drawing which is not transparent is possible, and drawing can be performed using ink including color material with large particle size or glitter as used in commercially available manicure or ink with high viscosity. With this, the degree of freedom of the type of ink which can be used in the nail print apparatus **1** is larger than, for example, an ink-jet type printer. When such type of ink is used, the ink does not dry easily and drying takes time, and when the applied ink come into contact with each other, the ink easily becomes mixed. According to the present embodiment, the specific unit region which is the drawing target is a region where all adjacent unit regions ar are at least the dried unit region ar in which the ink is applied and the drying is completed or the non-drawn unit region ar in which ink is not yet applied. Therefore, the blur of the image due to the ink mixing can be prevented while performing the drawing processing efficiently and quickly.

Embodiments of the present invention are described above. However, the present invention is not limited to the embodiments described above, and various modifications are possible without leaving the scope of the present invention.

For example, according to the present embodiment, the configuration including four writing tools **41** in the drawing unit **40** is described but the number of writing tools **41** provided in the drawing unit **40** is not limited to the above.

A standby space where the writing tool **41** stands by can be provided so that a plurality of writing tools **41** stands by in the standby space and the writing tool **41** held in the carriage can be suitably replaced while drawing. In this case, a plurality of types of writing tools **41** can be used for drawing even if only 1 carriage is provided in the drawing unit **40**.

According to the present embodiment, the drawing unit **40** includes only the writing tool **41**. However, the configuration of the drawing unit is not limited to the above.

For example, in addition to the writing tool **41**, the drawing unit can include an ink-jet type drawing head.

In this case, for example, after the drawing processing (drawing and drying) using the writing tool **41** is complete for all nails T, drawing using the ink-jet type drawing head is performed.

When the apparatus includes the ink-jet type drawing head other than the writing tool **41**, fine designs can be drawn with the ink-jet type drying head after applying the background color with the writing tool **41**, and the variety of the nail design which can be drawn becomes even wider.

According to the present embodiment, the nail print apparatus includes a nail judging unit **814** which judges whether the nail T positioned in the nail inserting unit **31** is the nail T instructed by the nail specifying unit **813**. However, the nail judging unit **814** does not need to be provided, and the drawing processing can be performed assuming that the user followed the instructions of the nail specifying unit **813** when the nail T is positioned in the finger inserting unit **31**.

According to the present embodiment, a solenoid is used as the writing tool raising/lowering mechanism to move the writing tool **41** up and down. However, the writing tool raising/lowering mechanism is not limited to the above. For example, a step motor, a DC motor, a motor, a ball screw or the like can be used.

According to the present embodiment, the X-direction moving stage **45** and the Y-direction moving stage **47** to move the drawing head **42** is composed of a combination of the X-direction moving motor **46** and the Y-direction moving motor **48** which are step motors and ball screws and guides which are not shown. However, the configuration to move the drawing head **42** is not limited to the above.

The X-direction moving motor **46** and the Y-direction moving motor **48** can be any mechanism which can freely move the drawing head **42** forward, backward, left and right. For example, a mechanism using a shaft, a guide, a wire and the like used in conventional low cost printers can be used or a servo motor can be used.

According to the present embodiment, the drawing data generating unit **815** performs curve correction of the image data of the nail design to generate the drawing data. However, the drawing data generating unit **815** generating the drawing data is not a necessary feature of the present invention. For example, the drawing control unit **816** can suitably convert the image data of the nail design with the LUT (Lookup Table) and output the image data to the drawing head to perform drawing which matches to the nail shape without separately generating drawing data.

According to the present embodiment, the shape of the nail T is detected as the nail information and the drawing data is generated based on the above. However, detecting the nail shape is not a necessary feature of the present invention. For example, when the outline of the nail T does not have to be extracted to perform the drawing, such as drawing a small design in the middle of the nail T, the shape of the nail T does not have to be accurately understood and the drawing can be performed without detecting the nail shape.

Although various exemplary embodiments have been shown and described, the invention is not limited to the

embodiments shown. Therefore, the scope of the invention is intended to be limited solely by the scope of the claims that follow and its equivalents.

What is claimed is:

1. A drawing apparatus comprising:

a drawing unit which applies ink to a drawing target region to perform drawing, the drawing target region is a surface of a plurality of nails of a plurality of fingers of a hand or a foot; and

a control unit which controls the drawing unit to perform the drawing on the drawing target region,

wherein,

in the drawing target region, at least any one of the plurality of nails includes a plurality of unit regions which are in contact with each other in at least one portion;

each of the two unit regions in contact with each other is a region to be drawn with ink in different colors; and

the control unit includes:

a nail specifying unit which, after the drawing unit applies ink to at least one unit region in the drawing target region, judges whether each of the plurality of unit regions is a dried unit region in which drying of the applied ink is completed, a non-dried unit region in which drying of the applied ink is not completed, or a non-drawn unit region in which the ink is not applied; extracts a specific unit region from the plurality of unit regions, wherein the specific unit region is the non-drawn unit region which are not in contact with the non-dried unit region; and specifies the nail including the specific unit region as a specific nail; and

a drawing control unit which controls the drawing unit to perform the drawing on the specific unit region in the specific nail.

2. The drawing apparatus according to claim **1**, wherein, the control unit repeats the operation of extracting the specific unit region, specifying the specific nail and controlling the drawing unit to perform the drawing on the specific unit region until all of the plurality of unit regions are judged to be the dried unit region.

3. The drawing apparatus according to claim **1**, wherein, when the specific unit region is not extracted from the plurality of unit regions, the control unit repeats search of the specific unit region in the plurality of unit regions until the specific unit region is extracted.

4. The drawing apparatus according to claim **1**, wherein, each of the plurality of unit regions is a region drawn with a single type of ink.

5. The drawing apparatus according to claim **1**, wherein, the drawing unit includes a drawing tool which comes into contact with the drawing target region to perform the drawing.

6. The drawing apparatus according to claim **1**, further comprising:

a display unit; and

a finger inserting unit in which one of the fingers can be inserted and the nail of the inserted finger can be positioned in a drawing position where the drawing by the drawing unit can be performed,

wherein,

the control unit includes a display control unit which displays on the display unit a message to urge inserting of a specific finger of a hand or a foot including the specific nail in the finger inserting unit.

7. The drawing apparatus according to claim **6**, wherein,

the control unit includes:

a nail information detecting unit which detects a shape of the nail positioned in the drawing position; and

a nail judging unit which judges whether the nail positioned in the drawing position is the specific nail based on the shape of the nail detected by the nail information detecting unit,

wherein, the display control unit displays on the display unit a message to urge inserting of the specific finger in the finger inserting unit when the nail judging unit judges that the nail positioned in the drawing position is not the specific nail.

8. The drawing apparatus according to claim **1**, wherein,

drying time required for completion of drying of the ink applied to the unit region is set for each unit region previously;

the control unit includes a drying notifying timer which notifies when elapsed time from when the drawing by the drawing unit in each unit region ends reaches the drying time set for the unit region; and

the nail specifying unit judges that the unit region which is notified by the drying notifying timer as reaching the drying time is judged to be the dried unit region.

9. The drawing apparatus according to claim **1**, wherein,

each of the plurality of unit regions is assigned a different area number in advance;

the nail specifying unit includes information of the area number of each unit region in contact with each other as surrounding relation information; and

the finger specifying unit obtains the area number of the unit region in contact with each unit region based on the surrounding relation information and judges whether the unit region with the obtained area number is the dried unit region, the non-dried unit region or the non-drawn unit region.

10. The drawing apparatus according to claim **9**, wherein,

the nail specifying unit includes information showing priority order of the drawing for each area number as priority order information; and

the nail specifying unit judges whether the unit region in contact with each unit region is the dried unit region, the non-dried unit region or the non-drawn unit region in order based on the priority order information.

11. A drawing method of a drawing apparatus including:

wherein the drawing apparatus comprising a drawing unit which applies ink to a drawing target region to perform drawing, the drawing target region is a surface of a plurality of nails of a plurality of fingers of a hand or a foot, wherein, in the drawing target region, at least any one of the plurality of nails includes a plurality of unit regions which are in contact with each other in at least one portion; and each of the two unit regions in contact with each other is a region to be drawn with ink in different colors,

judging, after the drawing unit applies ink to at least one unit region in the drawing target region, whether each of the plurality of unit regions is a dried unit region in which drying of the applied ink is completed, a non-dried unit region in which drying of the applied ink is not completed, or a non-drawn unit region in which the ink is not applied;

extracting a specific unit region from the plurality of unit regions, wherein the specific unit region is the non-drawn unit region which are not in contact with the non-dried unit region;

specifying the nail including the specific unit region as a specific nail; and

controlling the drawing unit to perform the drawing on the specific unit region in the specific nail.

12. The drawing method of the drawing apparatus according to claim **11**, wherein, the operation of extracting the specific unit region, specifying the specific nail and controlling the drawing unit to perform the drawing on the specific unit region by the drawing unit is repeated until all of the plurality of unit regions are judged to be the dried unit region.

13. The drawing method of the drawing apparatus according to claim **11**, wherein, in extracting the specific unit region, when the specific unit region is not extracted from the plurality of unit regions, searching of the specific unit region in the plurality of unit regions is repeated until the specific unit region is extracted.

14. The drawing method of the drawing apparatus according to claim **11**, wherein,

the drawing apparatus further includes,

a display unit; and

a finger inserting unit in which one of the fingers can be inserted and the nail of the inserted finger can be positioned in a drawing position where the drawing by the drawing unit can be performed, and

the drawing method further includes, displaying on the display unit a message to urge inserting of a specific finger of a hand or a foot including the specific nail in the finger inserting unit.

15. The drawing method of the drawing apparatus according to claim **14**, the method further comprising:

detecting a shape of the nail positioned in the drawing position;

judging whether the nail positioned in the drawing position is the specific nail based on the shape of the detected nail; and

displaying on the display unit a message to urge inserting of the specific finger in the finger inserting unit when it is judged that the nail positioned in the drawing position is not the specific nail.

16. The drawing method of the drawing apparatus according to claim **11**, wherein,

drying time required for completion of drying of the ink applied to the unit region is set for each unit region previously, and

the method further comprising:

counting elapsed time from when the drawing in each unit region ends;

outputting a signal to notify that the elapsed time reached the drying time set for each unit region; and

judging that the unit region which is notified as reaching the drying time is the dried unit region.

17. The drawing method of the drawing apparatus according to claim **11**, wherein,

each of the plurality of unit regions is assigned a different area number in advance; and

the drawing apparatus includes information of the area number of each unit region in contact with each other as surrounding relation information,

the method further comprising:

obtaining the area number of the unit region in contact with the specific unit region based on the surrounding relation information; and

judging whether the unit region with the obtained area number is the dried unit region, the non-dried unit region or the non-drawn unit region.

18. The drawing method of the drawing apparatus according to claim **17**, wherein,

the drawing apparatus includes information showing priority order of the drawing for each area number as priority order information; and

the method further comprising:

judging whether the unit region in contact with each unit region is the dried unit region, the non-dried unit region or the non-drawn unit region in order based on the priority order information.

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